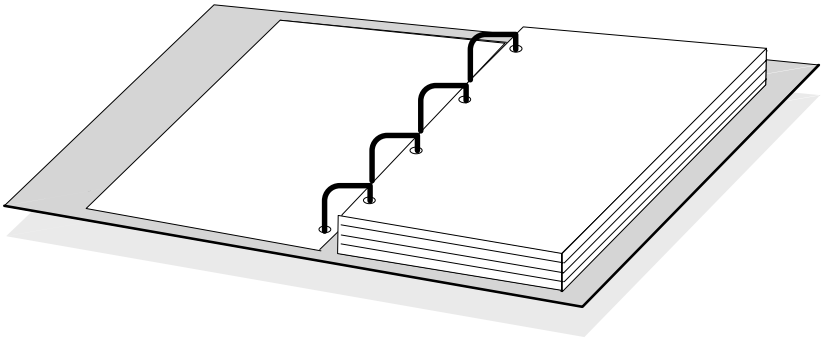

ABOUT THIS MANUAL

The service manual provides information required for service and repair (as far as carried out by the customer) of the digital switcher family DD5, DD10, DD20, DD20M and DD 30.

The manual contains the following sections:

- ☞ **General**
- ☞ **Technical data** of the individual switcher types
- ☞ **Functional description** of the individual subassemblies and p.c. boards
- ☞ **Computer-assisted error diagnosis**
- ☞ **Spare parts**
- ☞ **Mounting** parts and subassemblies

FURTHER INFORMATION

In addition to this service manual, the following manuals are also provided for the switcher family:

- ☞ **Operation manual DD5**
- ☞ **Operation manual DD10**
- ☞ **Operation manual DD20/DD30**
- ☞ **Operation manual DD20M**
- ☞ **Installation manual DD5 / DD10 / DD20 / DD30**
- ☞ **Installation manual DD20M**
- ☞ **Circuit Diagrams (for Philips service only)**

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SUPPLEMENT

1. GENERAL

1.1 NOTES

The present manual serves as an aid for an adequately trained service technician and enables him to localize and exchange defective components of the switcher.

Due to the high technology level (high integration, multilayer, SMD), repairing individual p.c. boards ”on site” is not possible. For this reason, publication of circuit diagrams in this service manual was renounced in favour of detailed diagnostic notes.

The defective p.c. boards detected by means of the diagnostic routines, have to be exchanged and can be returned to Philips.
Thus, you achieve a high availability. Repairing a defective p.c. board is only possible by the manufacturer.

Concider the following facts:

- The warranty is not valid any longer in case of improper handling.
- Each soldering on the p.c. boards causes damages.
- Statical discharges may distroy components on the p.c. board. For this reason, service technicians have to be connected to earth when doing service works.

The Philips service guarantees an optimum care of your switchers, ensuring a high availability.

Experience has shown that a great deal of errors are operating errors. Prior to exchanging subassemblies please make sure that they are really defective.

1.2 SHORT-FORM DESCRIPTION OF THE SWITCHERS

With regard to the function, the block diagrams do not differ between DD5 and DD10 as well as DD20 and DD 30.
The DD5 switcher has less functions due to partial equipment.
The DD20 switcher differs from the DD30 switcher in that the p.c. boards for the second ME stage are missing.

DD5/10: The input processor provides as main function:
DD20/30: The two input processors provide as main function:
a serial main crossbar with internal and external inputs. The external inputs receive the signals of the BNC input sockets on the connection board via automatic cable equalizers.
The internal inputs receive different switcher signals via buffers. In the crossbar, all coupling points are available, however, only those are controlled which are required for the respective functions.
Depending on the intended application, the serial outputs of the crossbar are fed to the key, ME and output processors.

DD5/10: Wipe, key and ME processors constitute the real mixing stage.

DD20/30: One wipe, key and ME processor each constitute a mixing stage. ME and PP stages are made up of equal p.c. boards.

Depending on the extension phase, the wipe processor includes one or two independent generators for generating the control signals required for wipe transitions.

From the output signals of the main crossbar, the key processor generates the key control signals for the key modes ”Linear Key”, ”Luminance Key” and ”Chroma-Key”.

Depending on the transition type, switchover is made in an internal parallel crossbar between the key control signals or the wipe control signals from the wipe processor. The key processor also carries all additional circuits such as mask generator, mask store and borderline generators.

The ME processor receives the serial output signals of the main crossbar as background or key fill signals and the parallel control signals of the key processor as wipe or key control signals. The ME processor carries the wipe stages for background and key wipes. The wipe stages are available twice for main signals and preview signals.

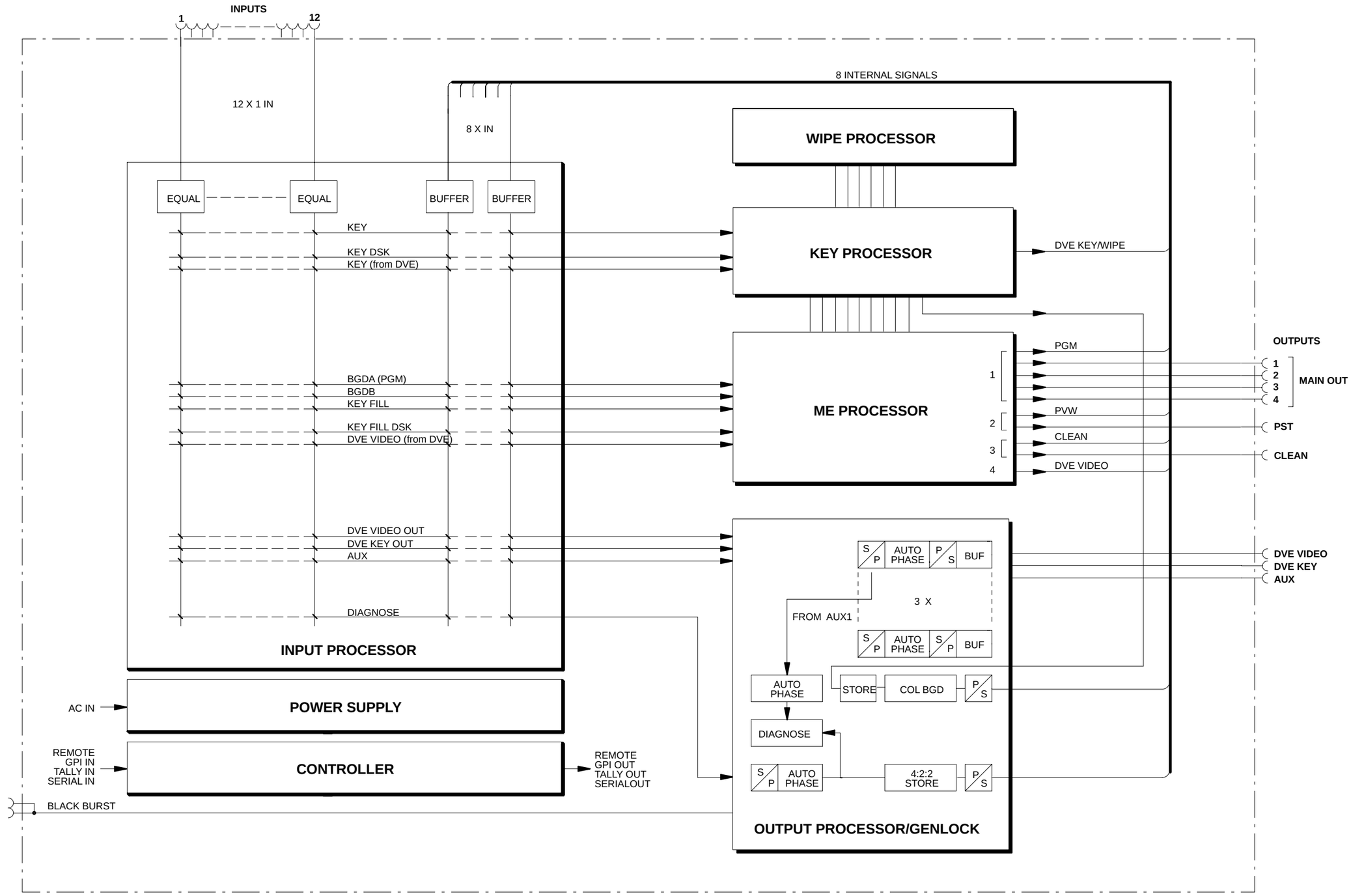
The outputs of the main crossbar fed to the output processor, are led via autophasing circuits and fed to the AUX output stages of the connector panel. The output processor also includes background matte generators with the matte store and the video store. A genlock clock generator is provided for clock supply of the complete switcher.

Control of all functions of the switcher is made via the controller board. The connections to control panel and GPI as well as tally facility run directly via the controller.

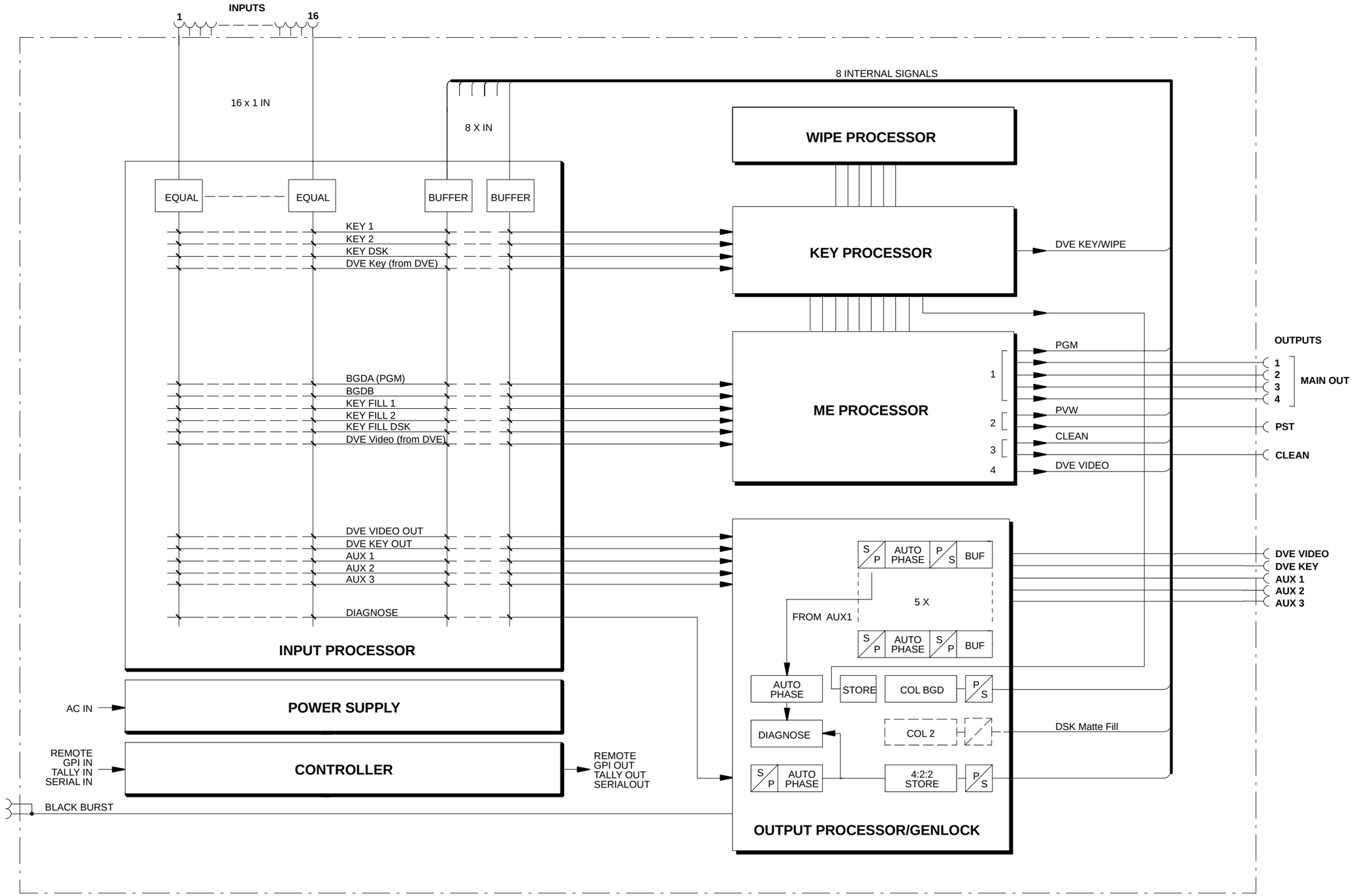
DD5/10: Current supply of the switcher electronics is made from the power supply.

DD20/30: Current supply of the switcher electronics is made from five single power packs.

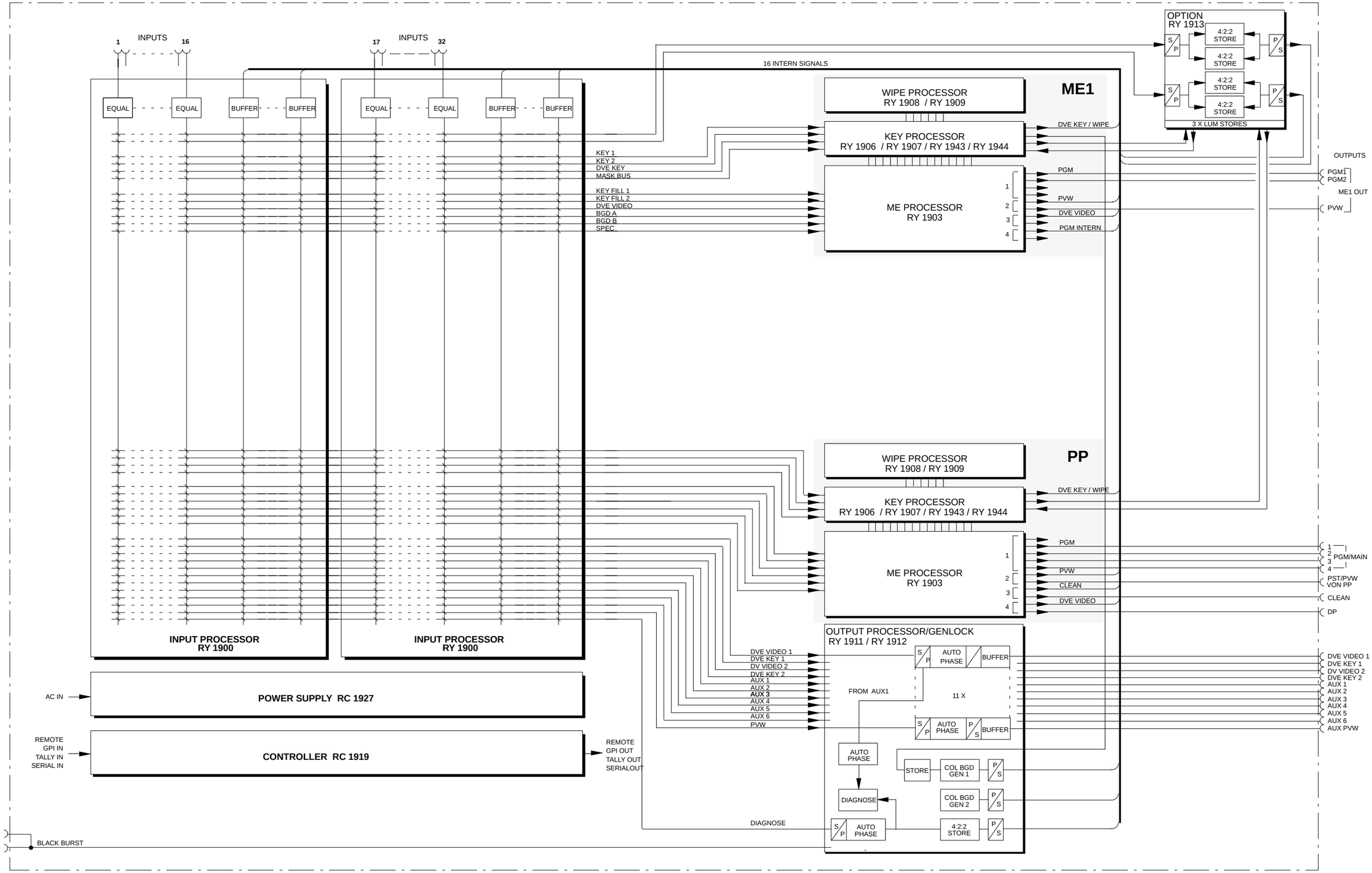
Block diagram DD5



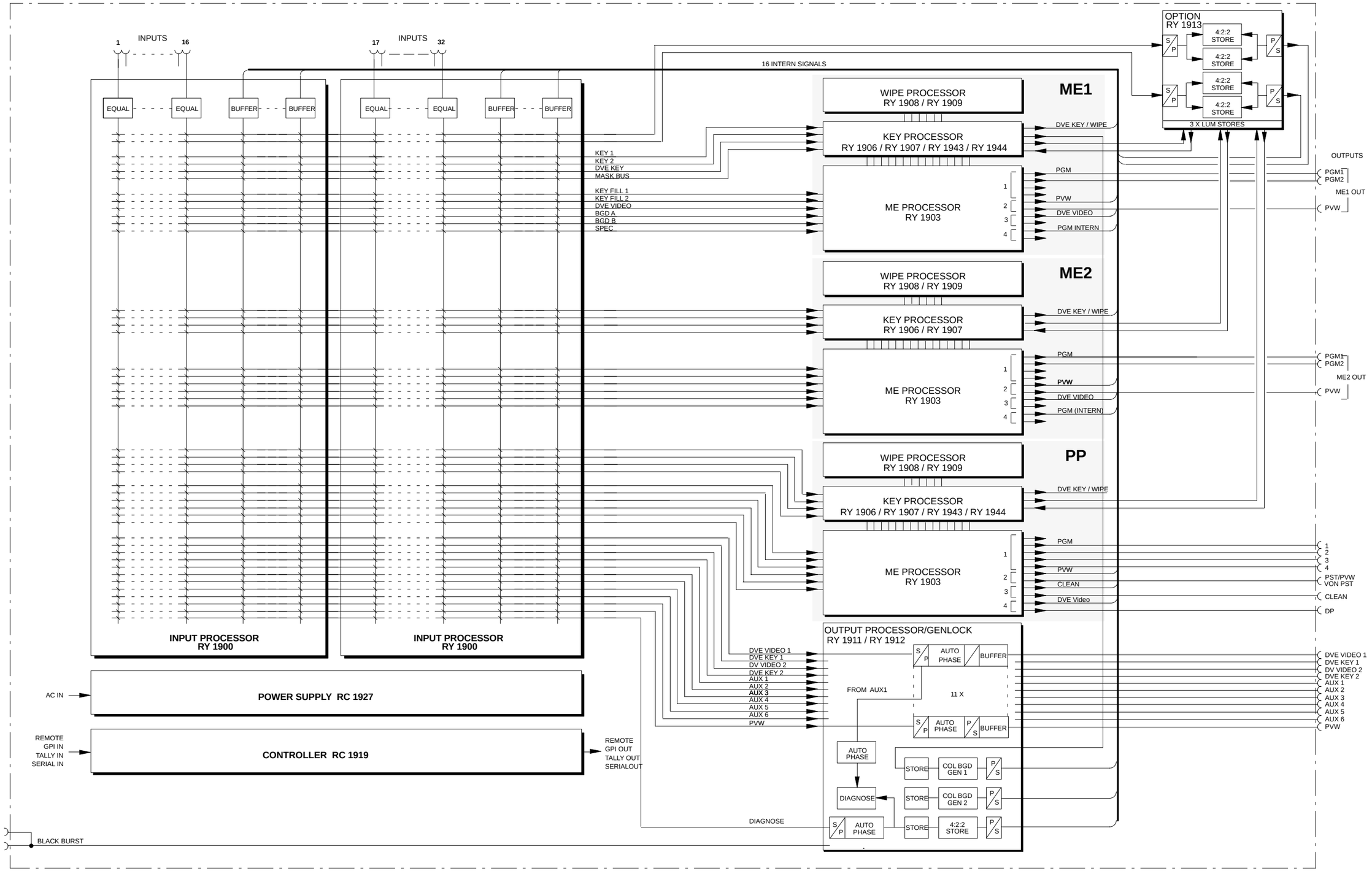
Block diagram DD10



Block diagram DD20



Block diagram DD30



2. TECHNICAL DATA

2.1 MICROSWITCHER DD5

INPUTS

– 12 vid. sig. and/or key sig.	BNC, serial component CCIR 656
– Input level	0.8 Vpp +1/-10 db, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits
– Common mode noise	2.5 Vpp DC - 1 kHz
– Return loss	5 - 270 Mbits > 10 db
– Autophasing range	52us
– Asynchronous signals	switchable
– Blackburst	2 BNC, CCVS, 1.0/0.45 Vpp ± 30 %, 75 ohms, DC 0 ± 0.1 V, can be looped through
– Return loss blackburst	up to 7 MHz > 30 db

OUTPUTS

– 4 program video signals	BNC, serial component CCIR 656
– 1 clean video signal	BNC, serial component CCIR 656
– 1 preset video signal	BNC, serial component CCIR 656
– 1 auxiliary bus	BNC, serial component CCIR 656
– 1 DVE video	BNC, serial component CCIR 656
– 1 DVE key	BNC, serial component CCIR 656
– Output level	0.8 Vpp ± 10%, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits or 8 bits rounded, switchable
Return loss	5 - 270 Mbits > 10 db

VIDEO SYSTEM DATA

– Standards, interlaced	525/60 or 625/50, switchable
– Data rate	270 Mbits/s
– Aspect ratio	4:3 or 16:9 (270 Mbits/s), switchable
– Signal processing video	4:2:2 in conformity with CCIR 601
– Sampling frequency lum.	13.5 MHz
– Sampling frequency chrom.	6.75 MHz
– Quantization video	10 bits
– Overall delay input/ program output	< 1 line
– Blanking horizontal	transparent for background signal
– Blanking vertical	transparent for background signal except for lines 6 and 319 (625L/50 Hz) or 10 and 273 (525L/60 Hz)

INTERFACE DATA

– 8 tally inputs	2 D-sub socket 9-pin TTL internal pull-up, control with dry contact
– 12 + 5 tally outputs	2 D-sub connector 50-pin 1 potential-free contact 24 V, 1 A for sources (12) contact 24 V, 1 A with common root for monitor (5),
– 8 GPI inputs, 8 GPI outputs	D-sub socket 25-pin inputs: TTL with optocoupler, control with dry contact, outputs: potential-free contact 24 V, 1 A
– 3 serial ports (E-box)	D-sub socket 9-pin, RS 422,
1 serial port (E-box)	D-sub socket 9-pin, RS 422 or RS 423, switchable
1 serial port (E-box)	D-sub socket 9-pin, RS 422 XBAR
– Service port (E-Box)	D-sub socket 9-pin, RS 232C
Remote (E-Box)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– Remote (control panel)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– 1 serial port (control panel)	D-sub socket 9-pin, RS 422,
– 1 mouse port (control panel)	D-sub connector 9-pin, RS 232C
– Service port (control panel)	D-sub socket 9-pin, RS 232C, optionally mouse or service, switchable

POWER SUPPLY

– Line voltage	AC 115 or 230 V +15/- 20 %, switchable
– Line frequency	50/60 Hz $\pm$ 5 %
– Power consumption E-box	< 400 W
– Power consum. contr. panel	< 100 W
– Cut-in current	< 16 A, < 100 A transient
– Power connection	cold unit connector IEC 320, VDE 0625 Part 1
– Safety regulations	VDE 805/5.90 (EN 60950)

ENVIRONMENTAL DATA

– Storage temp. E-box	– 20 ^{o}C - + 70 ^{o}C
– Storage temp. contr. pan.	0 ^{o}C - + 70 ^{o}C (32^{o} - 158 ^{o}F)
– Operating temp. E-box	+ 5 ^{o}C - +40 ^{o}C (41^{o} - 104 ^{o}F)
Op. temp. control panel	+ 5 ^{o}C - +40 ^{o}C (41^{o} - 104 ^{o}F)
– Ventilation E-box	140 m^{3}/h
– Relative humidity	$\leq$ 80 % non-condensing
– Electromagn. compability (EMC)	EN 55022, Class B FCC (47CFR) PART 15 Subp J Class A IEC 801-3, 3 V/m
– ESD	IEC 801-2, 8 kV

MECHANICAL DATA

– Dimensions E-box	212(h) x 483(w) x 470(d) mm, (19”, 5 RU) 1 RU under the electronics box has to be left free for ventilation and slide-in rails
– Dimensions contr. panel	373(h) x 482(w) x 97.5(d) mm
– Cutout meas. contr. panel	449 x 358 mm
– Ventilation E-box	Suction port: left side panel Blow-out port: rear top
– Weight E-box	20 kg
– Weight control panel	7 kg
– Mechanical stress	vibration IEC 68-2-6, shock IEC 68-2-29 tilt fall IEC 68-2-31,
– Color E-box	dark mushroom, Philips 10709/G8
– Color control panel	very dark grey, Philips 10714/G8

2.2 COMPACT SWITCHER DD10

INPUTS

– 16 video signals and/or key signals	BNC, serial component CCIR 656
– Input level	0.8 Vpp +1/-10 db, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits
– Common mode noise	2.5 Vpp DC - 1 kHz
– Return loss	5 - 270 Mbits > 10 db
– Autophasing range	52us
– Asynchronous signals	switchable
– Blackburst	2 BNC, CCVS, 1.0/0.45 Vpp ± 30 %, 75 ohms, DC 0 ± 0.1 V, can be looped through
– Return loss	up to 7 MHz > 30 dB

OUTPUTS

– 4 program video signals	BNC, serial component CCIR 656
– 1 clean video signal	BNC, serial component CCIR 656
– 1 preset video signal	BNC, serial component CCIR 656
– 3 auxiliary buses	BNC, serial component CCIR 656
– 1 DVE video	BNC, serial component CCIR 656
– 1 DVE key	BNC, serial component CCIR 656
– Output level	0.8 Vpp ± 10%, 75 ohms, DC 0 ± 0,5 V
– Quantization	10 bits or 8 bits rounded, switchable
Return loss	5 - 270 Mbits > 10 db

VIDEO SYSTEM DATA

– Standards, interlaced	525/60 or 625/50, switchable
– Data rate	270 Mbits/s
– Aspect ratio	4:3 or 16:9 (270 Mbits/s), switchable
– Signal processing video	4:2:2 in conformity with CCIR 601
– Sampling frequency lum.	13.5 MHz
– Sampling frequency chrom.	6.75 MHz
– Quantization video	10 bits
– Overall delay input/ program output	< 1 line
Blanking horizontal	transparent for background signal
– Blanking vertical	transparent for background signal except for lines 6 and 319 (625L/50 Hz) or 10 and 273 (525L/60 Hz)

INTERFACE DATA

– 8 tally inputs	2 D-sub socket 9-pin TTL internal pull-up, control with dry contact
– 16 + 7 tally outputs	2 D-sub connector 50-pin 1 potential-free contact 24 V, 1 A for sources (16) contact 24 V, 1 A with common root for monitor (7),
– 8 GPI inputs, 8 GPI outputs	D-sub socket 25-pin inputs: TTL with optocoupler, control with dry contact, outputs: potential-free contact 24 V, 1 A
– 3 serial ports (E-box)	D-sub socket 9-pin, RS 422,
1 serial port (E-box)	D-sub socket 9-pin, RS 422 or RS 423, switchable
1 serial port (E-box)	D-sub socket 9-pin, RS 422 XBAR
– Service port (E-Box)	D-sub socket 9-pin, RS 232C
Remote (E-Box)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– Remote (control panel)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– 1 serial port (control panel)	D-sub socket 9-pin, RS 422,
– 1 mouse port (control panel)	D-sub connector 9-pin, RS 232C
– Service port (control panel)	D-sub socket 9-pin, RS 232C, optionally mouse or service, switchable

POWER SUPPLY

– Line voltage	AC 115 or 230 V +15/- 20 %, switchable
– Line frequency	50/60 Hz ± 5 %
– Power consumption E-box	< 400 W
– Power cons. contr. panel	< 100 W
– Cut-in current	< 16 A, < 100 A transient
– Power connection	cold unit connector IEC 320, VDE 0625 Part 1
– Safety regulations	VDE 805/5.90 (EN 60950)

ENVIRONMENTAL DATA

– Storage temperature E-box	– 20 °C - + 70 °C
– Storage temp. control panel	0 °C - + 70 °C (32° - 158 °F)
– Operating temp. E-box	+ 5 °C - + 40 °C (41° - 104 °F)
– Operating temp. control panel	+ 5 °C - + 40 °C (41° - 104 °F)
– Ventilation E-box	140 m^3/h
– Relative humidity	$\leq$ 80 % non-condensing
– Electromagn. compability (EMC)	EN 55022, Class B FCC (47CFR) PART 15 Subp J Class A IEC 801-3, 3 V/m
– ESD	IEC 801-2, 8 kV

MECHANICAL DATA

– Dimensions E-box	212(h) x 483(w) x 470(d) mm, (19”, 5 RU) 1 RU under the electronics box has to be left free for ventilation and slide-in rails
– Dimensions control panel	385(h) x 640(w) x 97.5(d) mm
– Cutout meas. control panel	620 x 363 mm
– Ventilation E-box	Suction port: left side panel Blow-out port: rear top
– Weight E-box	20 kg
– Weight control panel	9.5 kg
– Mechanical stress	vibration IEC 68-2-6, shock IEC 68-2-29 tilt fall IEC 68-2-31,
– Color E-box	dark mushroom, Philips 10709/G8
– Color control panel	very dark grey, Philips 10714/G8

2.3 PRODUCTION SWITCHER DD20

INPUTS

– 32 video signals and/or key signals	BNC, serial component CCIR 656
– Input level	0.8 Vpp +1/-10 db, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits
– Common mode noise	2.5 Vpp DC - 1 kHz
– Return loss	5 - 270 Mbits > 10 db
– Autophasing range	32us
– Asynchronous signals	switchable
– Blackburst	2 BNC, CCVS, 1.0/0.45 Vpp ± 30 %, 75 ohms, DC 0 ± 0.1 V, can be looped through
– Return loss blackburst	up to 7 MHz > 30 db

OUTPUTS

– 4 program video signals	BNC, serial component CCIR 656
– 3 program video signals per ME	BNC, serial component CCIR 656
– 1 clean video signal	BNC, serial component CCIR 656
– 1 preset video signal	BNC, serial component CCIR 656
– 1 preview video signal per ME	BNC, serial component CCIR 656
– 3 - 5 auxiliary buses	BNC, serial component CCIR 656
– 1 - 2 DVE video	BNC, serial component CCIR 656
– 1 - 2 DVE key	BNC, serial component CCIR 656
– Output level	0.8 Vpp ± 10%, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits or 8 bits rounded, switchable
– Return loss	5 - 270 Mbits > 10 db

VIDEO SYSTEM DATA

– Standards, interlaced	525/60 or 625/50, switchable
– Data rate	270 Mbits/s
– Aspect ratio	4:3 or 16:9 (270 Mbits/s), switchable
– Signal processing video	4:2:2 in conformity with CCIR 601
– Sampling frequency lum.	13.5 MHz
– Sampling frequency chrom.	6.75 MHz
– Quantization video	10 bits
– Overall delay input/ program output	< 1 line
– Blanking horizontal	transparent for background signal
– Blanking vertical	transparent for background signal except for lines 6 and 319 (625L/50 Hz) or 10 and 273 (525L/60 Hz)

INTERFACE DATA

– 16 tally inputs	2 D-sub socket 9-pin TTL internal pull-up, control with dry contact
– 32 + 12 tally outputs	2 D-sub connector 50-pin 1 potential-free contact 24 V, 1 A for sources (32) contact 24 V, 1 A with common root for monitor (12)
– 8 GPI inputs, 8 GPI outputs	D-sub socket 25-pin inputs: TTL with optocoupler, control with dry contact, outputs: potential-free contact 24 V, 1 A
– 3 serial ports (E-box)	D-sub socket 9-pin, RS 422,
1 serial port (E-box)	D-sub socket 9-pin, RS 422 or RS 423, switchable
1 serial port (E-box)	D-sub socket 9-pin, RS 422 XBAR
– Service port (E-Box)	D-sub socket 9-pin, RS 232C
Remote (E-Box)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– Remote (control panel)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2,5 km, can be looped through
– 1 serial port (control panel)	D-sub socket 9-pin, RS 422,
1 mouse port (control panel)	D-sub connector 9-pin, RS 232C
– Service port (control panel)	D-sub socket 9-pin, RS 232C, optionally mouse or service, switchable

POWER SUPPLY

– Line voltage	AC 115 or 230 V +15/- 20 %, switchable
– Line frequency	50/60 Hz ± 5 %
– Power consumption E-box	< 1000 W
– Power cons. control panel	< 150 W
– Cut-in current	< 16 A, < 100 A transient
Power connection	cold unit connector IEC 320, VDE 0625 Part 1
– Safety regulations	VDE 805/5.90 (EN 60950)

ENVIRONMENTAL DATA

– Storage temperature E-box	– 20 °C - + 70 °C
– Storage temperature E-box	0 °C - + 70 °C (32° - 158 °F)
– Operating temp. E-box	+ 5 °C - +40 °C (41° - 104 °F)
– Operating temp. contr. panel	+ 5 °C - +40 °C (41° - 104 °F)
– Ventilation E-box	430 m^3/h
– Relative humidity	$\leq$ 80 % non-condensing
– Electromagn. compability (EMC)	EN 55022, Class B FCC (47CFR) PART 15 Subp J Class A IEC 801-3, 3 V/m
– ESD	IEC 801-2, 8 kV

MECHANICAL DATA

– Dimensions E-box	533(h) x 483(w) x 470(d) mm, (19”, 12 RU) 1 RU under the electronics box has to be left free for ventilation and slide-in rails
– Dimensions control panel	551(h) x 1187(w) x 99(d) mm
– Cutout measures contr. pan.	525(l) x 1164(w)
– Ventilation	Suction port: left side panel Blow-out port: rear top
– Weight E-box	40 kg
– Weight control panel	26 kg
– Mechanical stress	vibration IEC 68-2-6, shock IEC 68-2-29 tilt fall IEC 68-2-31,
Color E-box	dark mushroom, Philips 10709/G8
– Color control panel	very dark grey, Philips 10714/G8

2.4 PRODUCTION SWITCHER DD30

INPUTS

– 32 video signals and/or key signals	BNC, serial component CCIR 656
– Input level	0.8 Vpp +1/-10 db, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits
– Common mode noise	2.5 Vpp DC - 1 kHz
– Return loss	5 - 270 Mbits > 10 db
– Autophasing range	32us
– Asynchronous signals	switchable
– Blackburst	2 BNC, CCVS, 1.0/0.45 Vpp ± 30 %, 75 ohms, DC 0 ± 0,1 V, can be looped through
– Return loss blackburst	up to 7 MHz > 30 db

OUTPUTS

– 4 program video signals	BNC, serial component CCIR 656
– 3 program vid. sig. per ME	BNC, serial component CCIR 656
– 1 clean video signal	BNC, serial component CCIR 656
– 1 preset video signal	BNC, serial component CCIR 656
– 1 preview vid. sig. per ME	BNC, serial component CCIR 656
– 3 - 5 auxiliary buses	BNC, serial component CCIR 656
– 1 - 2 DVE video	BNC, serial component CCIR 656
– 1 - 2 DVE key	BNC, serial component CCIR 656
– Output level	0.8 Vpp ± 10%, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits or 8 bits rounded, switchable
– Return loss	5 - 270 Mbits > 10 db

VIDEO SYSTEM DATA

– Standards, interlaced	525/60 or 625/50, switchable
– Data rate	270 Mbits/s
– Aspect ratio	4:3 or 16:9 (270 Mbits/s), switchable
– Signal processing video	4:2:2 in conformity with CCIR 601
– Sampling frequency lum.	13.5 MHz
– Sampling frequency chrom.	6.75 MHz
– Quantization video	10 bits
– Overall delay input/ program output	< 1 line
– Blanking horizontal	transparent for background signal
– Blanking vertical	transparent for background signal except for lines 6 and 319 (625L/50 Hz) or 10 and 273 (525L/60 Hz)

INTERFACE DATA

– 16 tally inputs	2 D-sub socket 9-pin TTL internal pull-up, control with dry contact
– 32 + 13 tally outputs	2 D-sub connector 50-pin 1 potential-free contact 24 V, 1 A for sources (32) contact 24 V, 1A with common root for monitor (12)
– 8 GPI inputs, 8 GPI outputs	D-sub socket 25-pin inputs: TTL with optocoupler, control with dry contact, outputs: potential-free contact 24 V, 1 A
– 3 serial ports (E-box)	D-sub socket 9-pin, RS 422,
1 serial port (E-box)	D-sub socket 9-pin, RS 422 or RS 423, switchable
1 serial port (E-box)	D-sub socket 9-pin, RS 422 XBAR
– Service port (E-Box)	D-sub socket 9-pin, RS 232C
Remote (E-Box)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– Remote (control panel)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– 1 serial port (contr. pan.)	D-sub socket 9-pin, RS 422,
1 mouse port (contr. pan.)	D-sub connector 9-pin, RS 232C
– Service port (control pan.)	D-sub socket 9-pin, RS 232C, optionally mouse or service, switchable

POWER SUPPLY

– Line voltage	AC 115 or 230 V +15/- 20 %, switchable
– Line frequency	50/60 Hz ± 5 %
– Power consumption E-box	< 1000 W
– Power cons. control panel	< 300 W
– Cut-in current	< 16 A, < 100 A transient
– Power connection	cold unit connector IEC 320, VDE 0625 Part 1
– Safety regulations	VDE 805/5.90 (EN 60950)

ENVIRONMENTAL DATA

– Storage temperature E-box	– 20 °C - + 70 °C
– Storage control panel E-box	0 °C - + 70 °C (32° - 158 °F)
– Operating temp. E-box	+ 5 °C - + 40 °C (41° - 104 °F)
– Operating temp. contr. pan.	+ 5 °C - + 40 °C (41° - 104 °F)
– Ventilation E-box	430 m^3/h
– Relative humidity	$\leq$ 80 % non-condensing
– Electromagn. compability (EMC)	EN 55022, Class B FCC (47CFR) PART 15 Subp J Class A IEC 801-3, 3 V/m
– ESD	IEC 801-2, 8 kV

MECHANICAL DATA

– Dimensions E-box	533(h) x 483(w) x 470(d) mm, (19”, 12 RU) 1 RU under the electronics box has to be left free for ventilation and slide-in rails
– Dimensions control panel	687(h) x 1350(w) x 99(d) mm
– Cutout measures contr. pan.	1330(l) x 664(w) mm
– Ventilation	
– Weight E-box	41 kg
– Weight control panel	33 kg
– Mechanical stress	vibration IEC 68-2-6, shock IEC 68-2-29 tilt fall IEC 68-2-31,
– Color E-box	dark mushroom, Philips 10709/G8
– Color control panel	very dark grey, Philips 10714/G8

2.5 MASTER CONTROL SWITCHER DD20M

INPUTS

– 32 video signals and/or key signals	BNC, serial component CCIR 656
– Input level	0.8 Vpp +1/-10 db, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits
– Common mode noise	2.5 Vpp DC - 1 kHz
– Return loss	5 - 270 Mbits > 10 db
– Autophasing range	32us
– Asynchronous signals	switchable
– Blackburst	2 BNC, CCVS, 1.0/0.45 Vpp ± 30 %, 75 ohms, DC 0 ± 0.1 V, can be looped through
– Return loss blackburst	up to 7 MHz > 30 db

OUTPUTS

– 4 program video signals	BNC, serial component CCIR 656
– 1 clean video signal	BNC, serial component CCIR 656
– 1 PVW bus	BNC, serial component CCIR 656
– 1 preview PST	BNC, serial component CCIR 656
– 1 preview DP	BNC, serial component CCIR 656
– Output level	0.8 Vpp ± 10%, 75 ohms, DC 0 ± 0.5 V
– Quantization	10 bits or 8 bits rounded, switchable
– Return loss	5 - 270 Mbits > 10 db

VIDEO SYSTEM DATA

– Standards, interlaced	525/60 or 625/50, switchable
– Data rate	270 Mbits/s
– Aspect ratio	4:3 or 16:9 (270 Mbits/s), switchable
– Signal processing video	4:2:2 in conformity with CCIR 601
– Sampling frequency lum.	13.5 MHz
– Sampling frequency chrom.	6.75 MHz
– Quantization video	10 bits
– Overall delay input/ program output	< 1 line
– Blanking horizontal	transparent for background signal
– Blanking vertical	transparent for background signal except for lines 6 and 319 (625L/50 Hz) or 10 and 273 (525L/60 Hz)

INTERFACE DATA

– 8 tally inputs	2 D-sub socket 9-pin TTL internal pull-up, control with dry contact
– 12 + 5 tally outputs	2 D-sub connector 50-pin 1 potential-free contact 24 V, 1 A for sources (12) contact 24 V, 1 A with common root for monitor (5)
– 8 GPI inputs, 8 GPI outputs	D-sub socket 25-pin inputs: TTL with optocoupler, control with dry contact, outputs: potential-free contact 24 V, 1 A
– 3 serial ports (E-box)	D-sub socket 9-pin, RS 422,
1 serial port (E-box)	D-sub socket 9-pin, RS 422 or RS 423, switchable
1 serial port (E-box)	D-sub socket 9-pin, RS 422 XBAR
– Service port (E-Box)	D-sub socket 9-pin, RS 232C
Remote (E-Box)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2.5 km, can be looped through
– Remote (control panel)	2 BNC (remote), cheapernet, 50 ohms, 150 m, with repeater max. 2,5 km, can be looped through
– 1 serial port (control panel)	D-sub socket 9-pin, RS 422,
– Service port (control panel)	D-sub socket 9-pin, RS 232C,

POWER SUPPLY

– Line voltage	AC 115 or 230 V +15/- 20 %, switchable
– Line frequency	50/60 Hz ± 5 %
– Power consumption E-box	< 400 W
– Power cons. control panel	< 100 W
– Cut-in current	< 16 A, < 100 A transient
Power connection	cold unit connector IEC 320, VDE 0625 Part 1
– Safety regulations	VDE 805/5.90 (EN 60950)

ENVIRONMENTAL DATA

– Storage temperature E-box	– 20 °C - + 70 °C
– Storage temperature E-box	0 °C - + 70 °C (32° - 158 °F)
– Operating temp. E-box	+ 5 °C - +40 °C (41° - 104 °F)
– Operating temp. contr. panel	+ 5 °C - +40 °C (41° - 104 °F)
– Ventilation E-box	430 m^3/h
– Relative humidity	$\leq$ 80 % non-condensing
– Electromagn. compability (EMC)	EN 55022, Class B FCC (47CFR) PART 15 Subp J Class A IEC 801-3, 3 V/m
– ESD	IEC 801-2, 8 kV

MECHANICAL DATA

– Dimensions E-box	533(h) x 483(w) x 470(d) mm, (19”, 12 RU) 1 RU under the electronics box has to be left free for ventilation and slide-in rails
– Dimensions control panel	300(h) x 800(w) x 97.5(d) mm
– Cutout measures contr. pan.	780(l) x 278(w)
– Ventilation	Suction port: left side wall Blow-out port: rear top
– Weight E-box	35 kg
– Weight control panel	8.5 kg
– Mechanical stress	vibration IEC 68-2-6, shock IEC 68-2-29 tilt fall IEC 68-2-31,
Color E-box	dark mushroom, Philips 10709/G8
– Color control panel	very dark grey, Philips 10714/G8

3. FUNCTIONAL DESCRIPTION

3.1 CONTROL PANEL RPD 5

Control panel RPD 5 consists of a one-piece plastic-coated engraved plate and an underdesk part being connected with each other via two hinges. The keyboard is screwed to the engraved plate. The underdesk part contains the controller board required for control, the power supply as well as the connection unit for the electrical connections off the board. The connector sockets are fixed-connected with the controller board.

Control panel RPD 5 with serial number 0 351 670 000 comprises the following subassemblies:

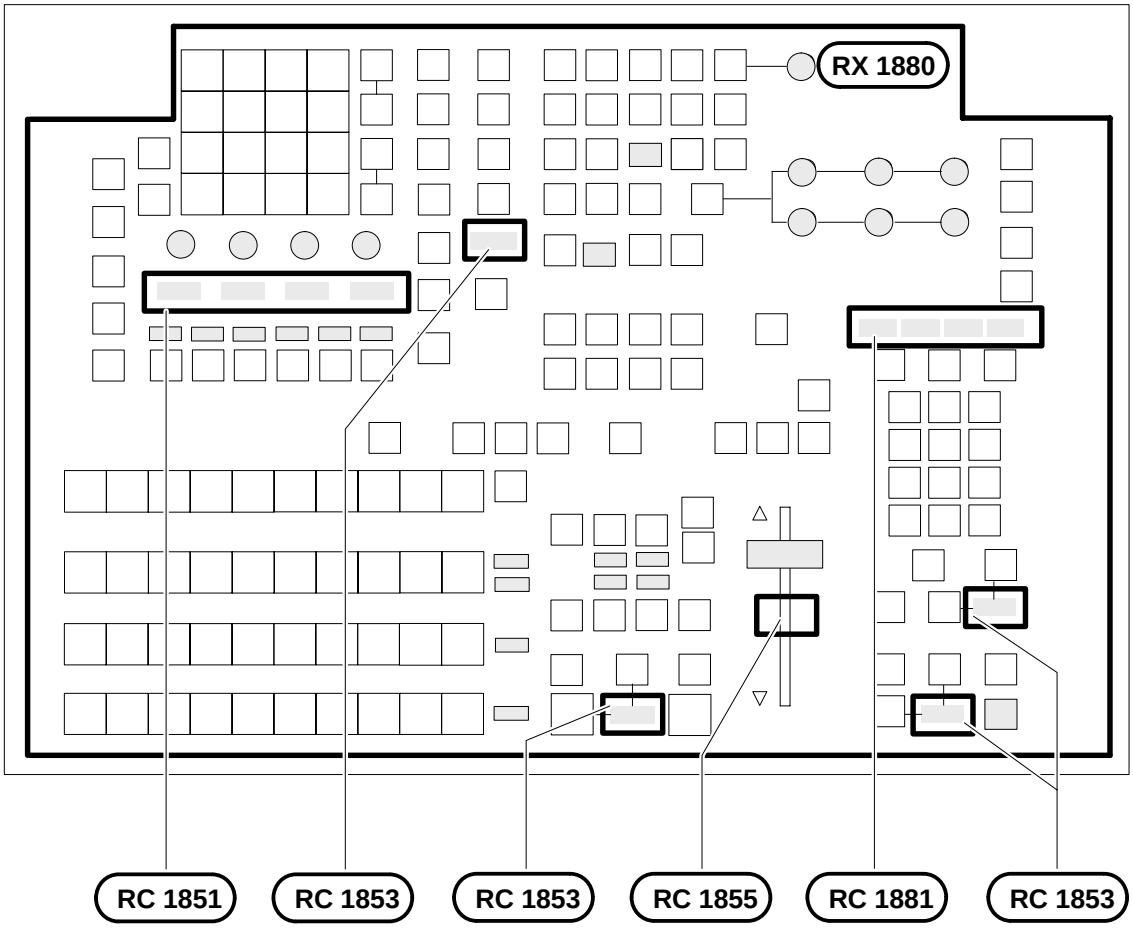
Type	Designation	Order number
Control panel cover		
RX 1880 incl.: RC 1851 RC 1853 4x RC 1881	Keyboard LED board (4 digits) LED board (1 digit) LED board (4 digits)	0 351 670 100 0 351 660 200 0 351 660 400 0 351 670 200
RC 1858 incl.: RC 1855	Fader assembly Connector panel	0 351 661 200 0 351 660 900
Underdesk part		
RY 1821 RY 1822	Controller EGA (or) Controller VGA	0 351 692 200 0 351 692 300
RC 1882	Power supply	0 351 670 300
	PC mouse	3 114 019 010

Opening the control panel

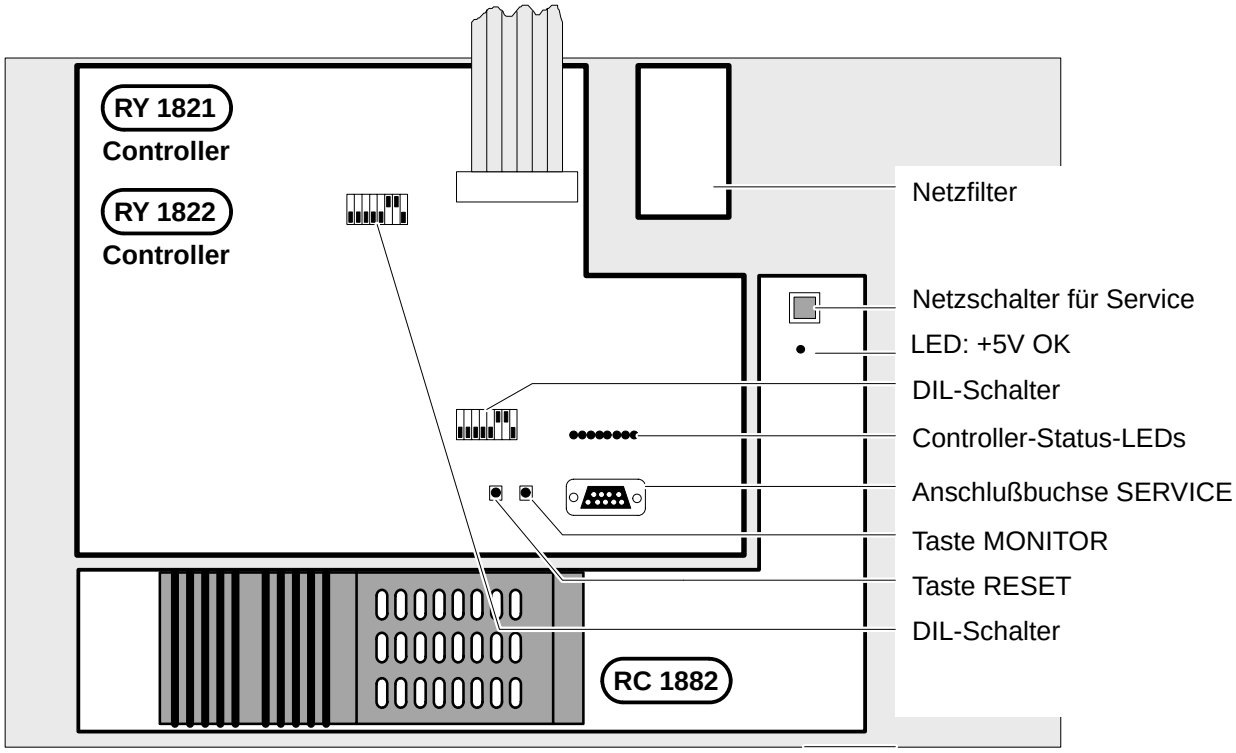
For opening the control panel, use a screwdriver to unlock (in ccw direction) the two locking screws located to the right and left on the engraved plate. The control panel cover can then be hinged upwards. When opened, it is secured by the hinge. By a slight pressure, the control panel can be closed again.

Attention! Risk of squeezing when closing the control panel.

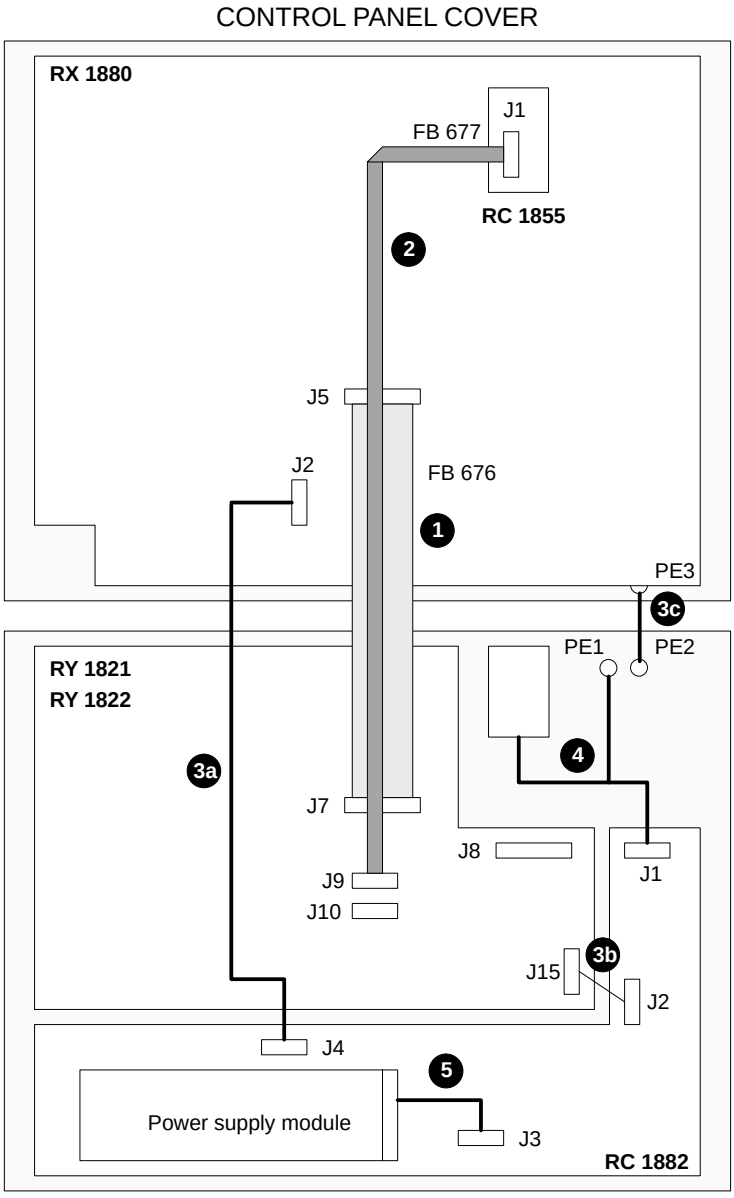
P.c. boards in control panel cover RPD 5



P.c. boards in underdesk part RPD 5



Internal cabling RPD 5



1 = Flat cable 40-pin FB 676, order no.: 0 701 257 600

2 = Flat cable 10-pin FB 677, order no.: 0 701 257 700

3 = Jumper set RC 1883
comprising:

3a = DC voltage cabling

3b = DC voltage cabling

3c = Earth cabling

4 = Jumper set RC 1937 – line voltage cabling

5 = Jumper set RC 1938 – line voltage cabling

3.2 CONTROL PANEL RPD 10

Control panel RPD 10 consists of a one-piece, plastic-coated, engraved plate and an underdesk part being connected with each other via two hinges. The keyboards are screwed to the engraved plate. The underdesk part contains the controller board required for control, the power supply as well as the connection unit for the electrical connections off the board. The p.c. boards in the underdesk part are located on a common bottom plate which can be taken out by loosening 6 fastening screws. The connector sockets are fixed-connected with the controller board.

Control desk RPD 10 with serial number 0 351 660 000 comprises the following subassemblies:

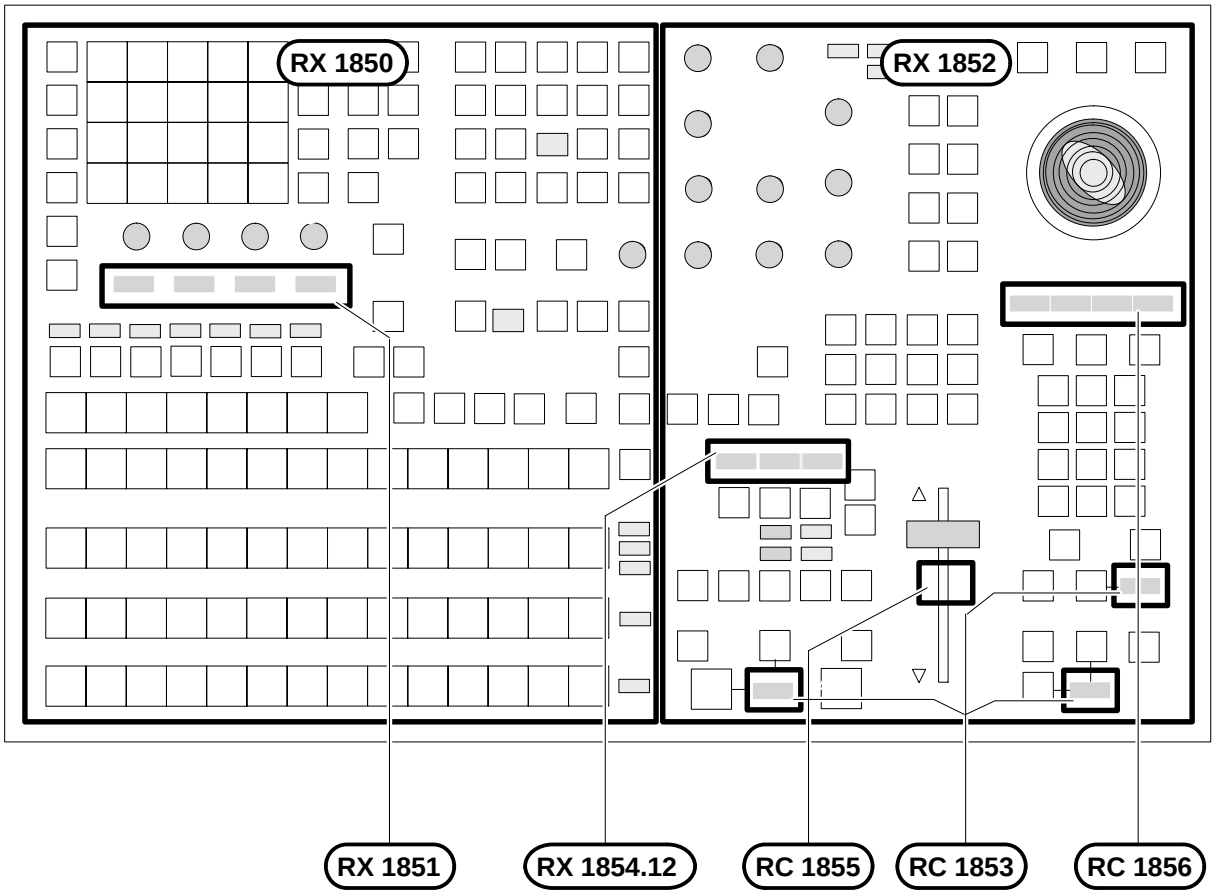
Type	Designation	Order number
Control panel cover		
RX 1850 incl.: RX 1851	Crossbar selection LED board (4 digits)	0 351 660 100 0 351 660 200
RX 1852 incl.: RC 1853 3x RX 1854.12 RC 1856	Transition selection LED-Board (1 digit) LED-Board (3 digits) LED-Board (4 digits)	0 351 660 300 0 351 660 400 0 351 660 800 0 351 661 000
RC 1858 incl.: RC 1855	Fader Connector panel	0 351 661 200 0 351 660 900
Underdesk part		
RY 1821 RY 1822	Controller EGA (or) Controller VGA	0 351 692 200 0 351 692 300
RC 1832	Power supply	0 351 693 900
OPTIONS		
	PC mouse	3 114 019 010

Opening the control panel

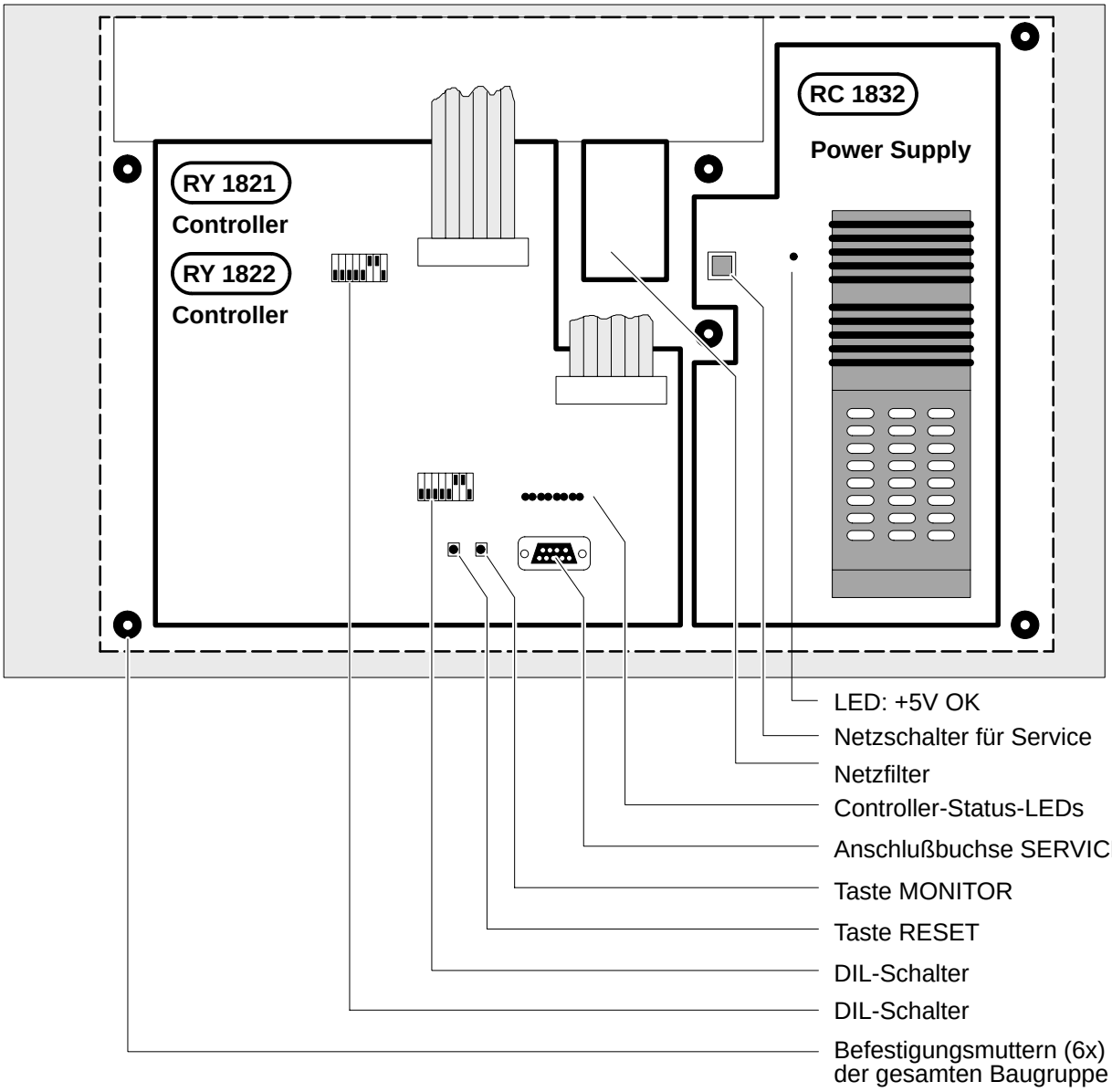
For opening the control panel, use a screwdriver to unlock (in ccw direction) the two locking screws located to the right and left on the engraved plate. The control desk plate can then be hinged upwards. When opened, it is secured by the hinge. By a slight pressure, the control panel can be closed again.

Attention! Risk of squeezing when closing the control panel.

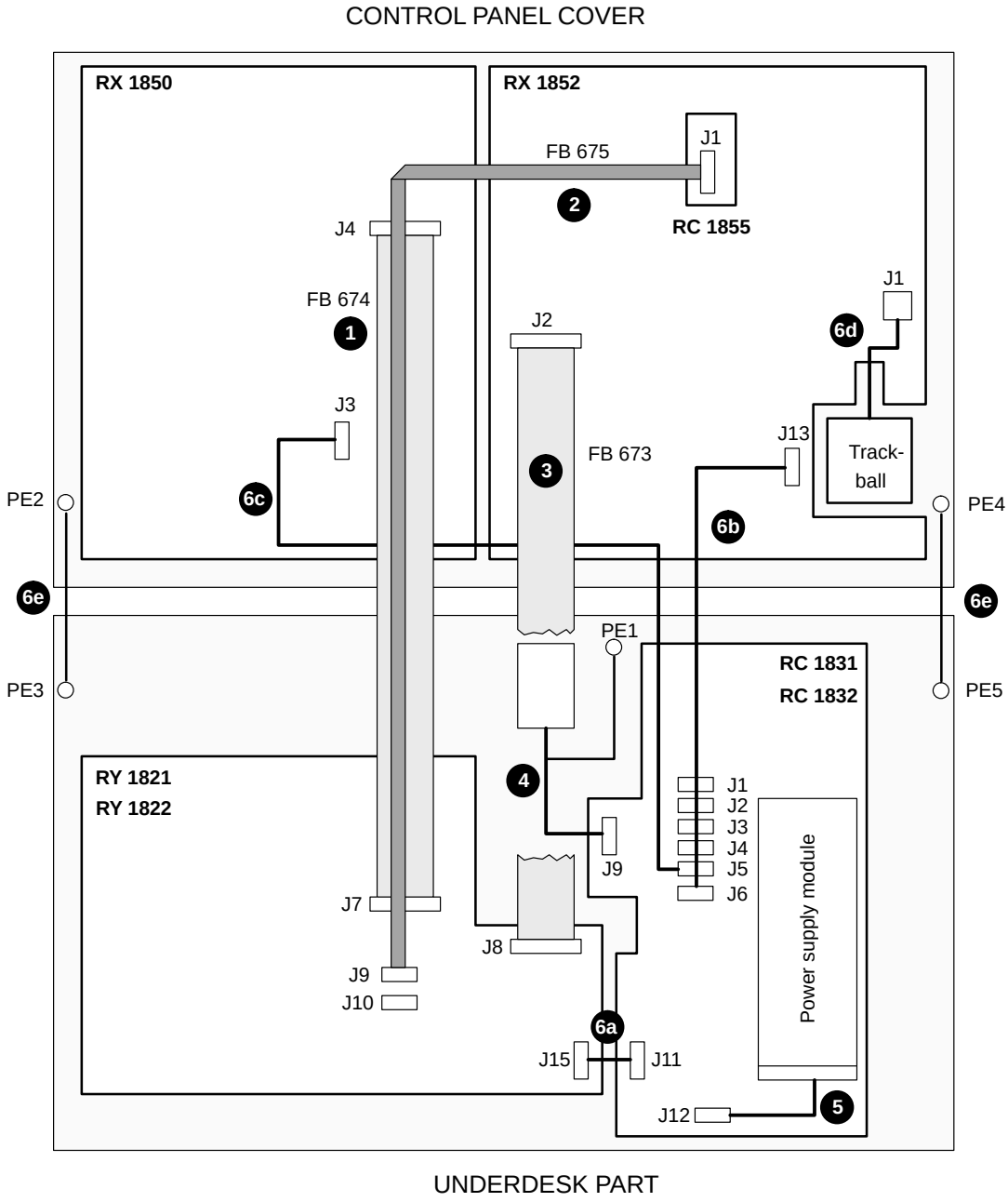
P.c. boards in control panel cover RPD 10



P.c. boards in underdesk part RPD 10



Internal cabling RPD 10



1 = Flat cable 40-pin FB 674, order no.: 0 701 257 400

2 = Flat cable 10-pin FB 675, order no.: 0 701 257 500

3 = Flat cable 40-pin FB 673, order no.: 0 701 257 300

4 = Jumper set RC 1937 – line voltage cabling

5 = Jumper set RC 1938 – line voltage cabling

6 = Jumper set RC 1857
comprising:

6a = DC voltage cabling (controller)

6b = DC voltage cabling (keyboard)

6c = DC voltage cabling (keyboard)

6d = Connection cable (modular connector) 8-pin (trackball)

6e = 2x earth cabling

3.3 CONTROL PANEL RPD 20

Control panel **RPD 20** consists of two one-piece, plastic-coated, engraved plates and an underdesk part being connected with each other via two hinges. The keyboards are screwed to the engraved plate. The underdesk part contains the controller board required for control, the power supply as well as the connection unit for the electrical connections off the board. The p.c. boards in the underdesk part are located on a common bottom plate which can be taken out by loosening 6 fastening screws. The connector sockets are fixed-connected with the controller board.

Control desk **RPD 20** with serial number 0 351 680 000 comprises the following subassemblies:

Type		Designation	Order number
Control panel cover			
RX 1816.12		Wipe selection	0 351 693 500
incl.:			
RC 1825	2x	LED display (4 digits)	0 351 692 600
RX 1819		Display selection	0 351 692 000
incl:			
RX 1804.12		LED display (13 digits)	0 351 693 400 *
RC 1858	3x	Fader assembly	0 351 661 200
incl:			
RC 1855		Connector panel	0 351 660 900
RX 2000		Display board	0 351 680 100
incl:			
RC 2006		LED display (6 digits)	0 351 680 700 *
RX 2001		Crossbar selection 1	0 351 680 200
incl.:			
RC 2006	2x	LED display (6 digits)	0 351 680 700 *
RX 2002		Crossbar selection 2	0 351 680 300
incl.:			
RX 1804.12	2x	LED display (13 digits)	0 351 693 400 *
RX 2003		Transition selection	0 351 680 400
incl.:			
RC 1853	2x	LED display (1 digit)	0 351 660 400
RC 1854.11	2x	LED display (4 digits)	0 351 660 500
RX 2004		EXTRA selection	0 351 680 500
incl.:			
RC 1805		LED display (2 digits)	0 351 690 600
RC 1853	2x	LED display (1 digit)	0 351 660 400
RC 1856		LED display (4 digits)	0 351 661 000
RX 2005		Chromakey selection	0 351 680 600
incl.:			
RC 1853		LED display (1 digit)	0 351 660 400
——		Trackball	3 114 019 002
Underdesk part			
RY 1821		Controller EGA (or)	0 351 692 200
RY 1821		Controller VGA	0 351 692 300
RC 1831		Power supply redundant (or)	0 351 693 200
RC 1832		Power supply	0 351 693 900
OPTIONS			
		PC mouse	3 114 019 010

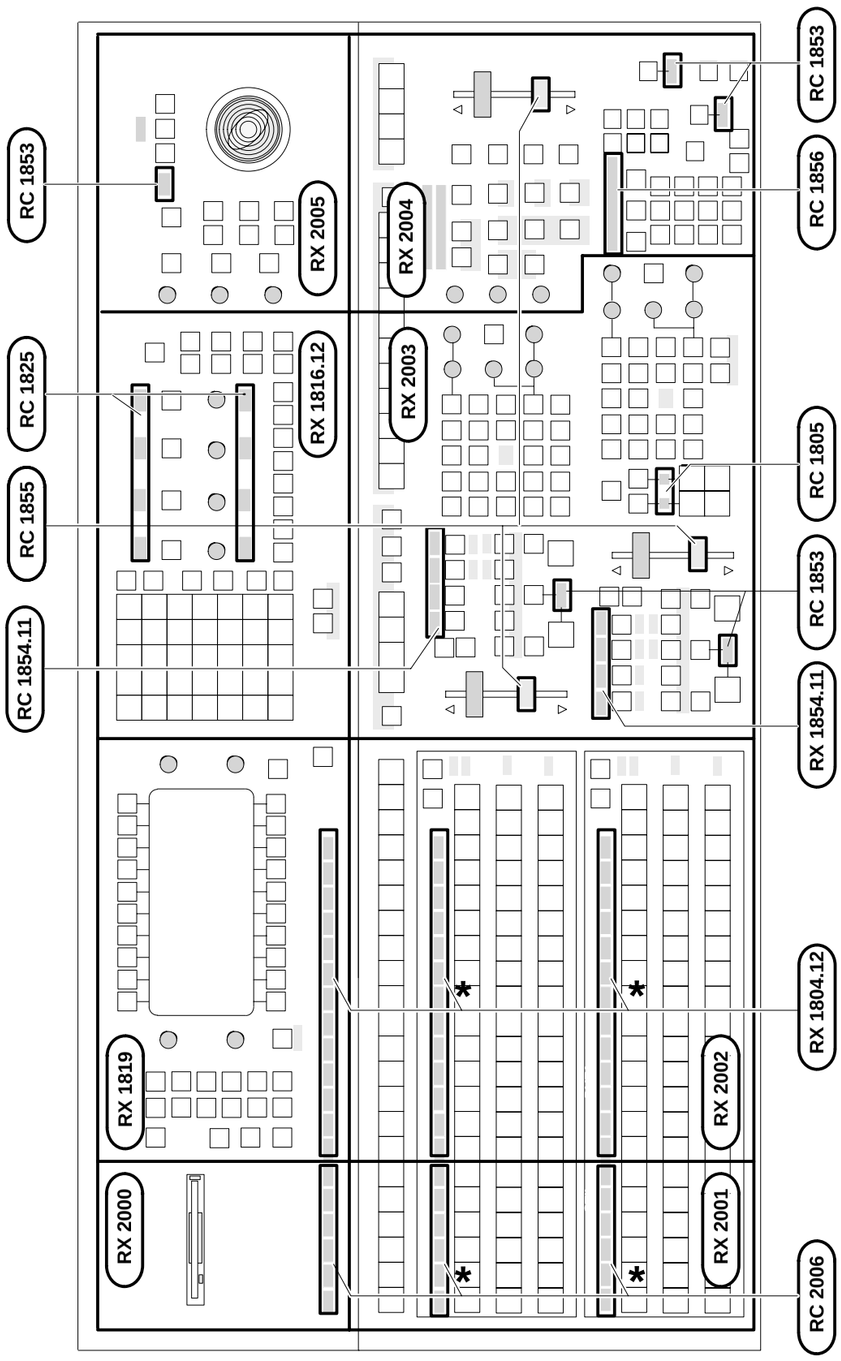
* Option RY 1962 Input Mnemonics 0 212 187 700 (ex factory only!)

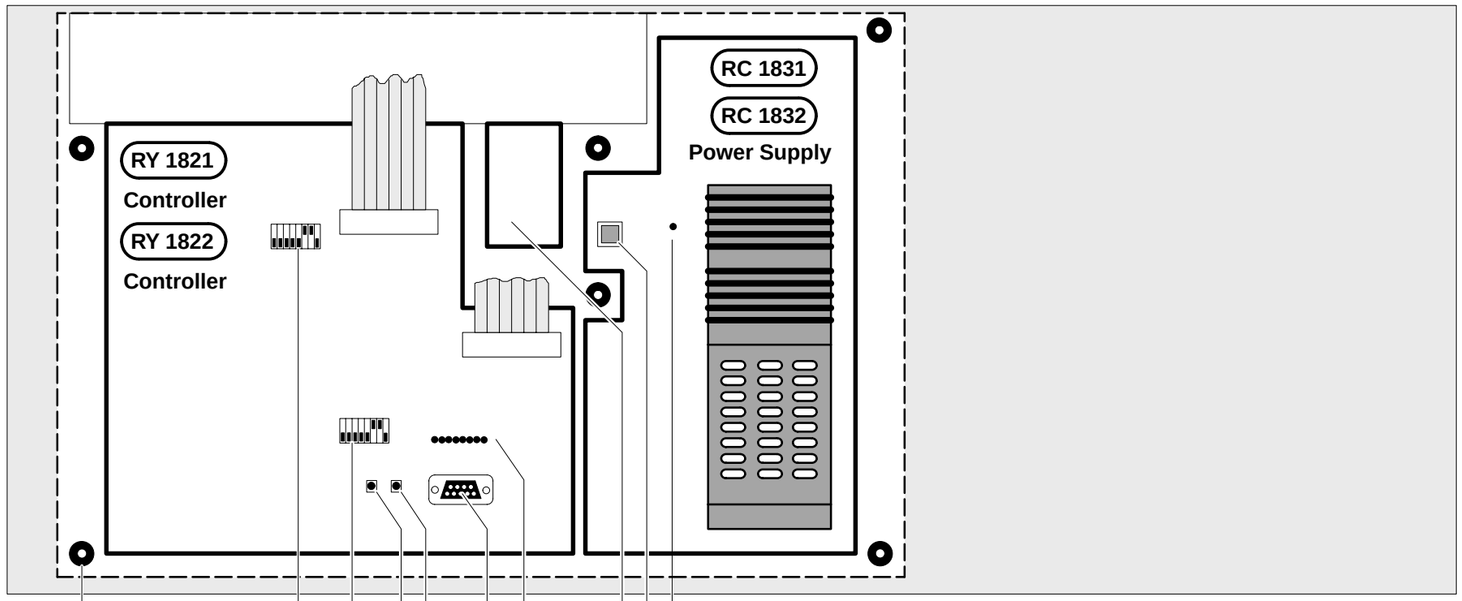
Opening the control panel

For opening the control panel, use a screwdriver or coin to unlock (in ccw direction) the four locking screws located to the right and left on the engraved plate. Two pneumatic springs enabled to easily lift up the control desk plate so the it can be hinged upwards. When opened, it is secured by the hinge. By a slight pressure, the control panel can be closed again.

Attention! Risk of squeezing when closing the control panel.

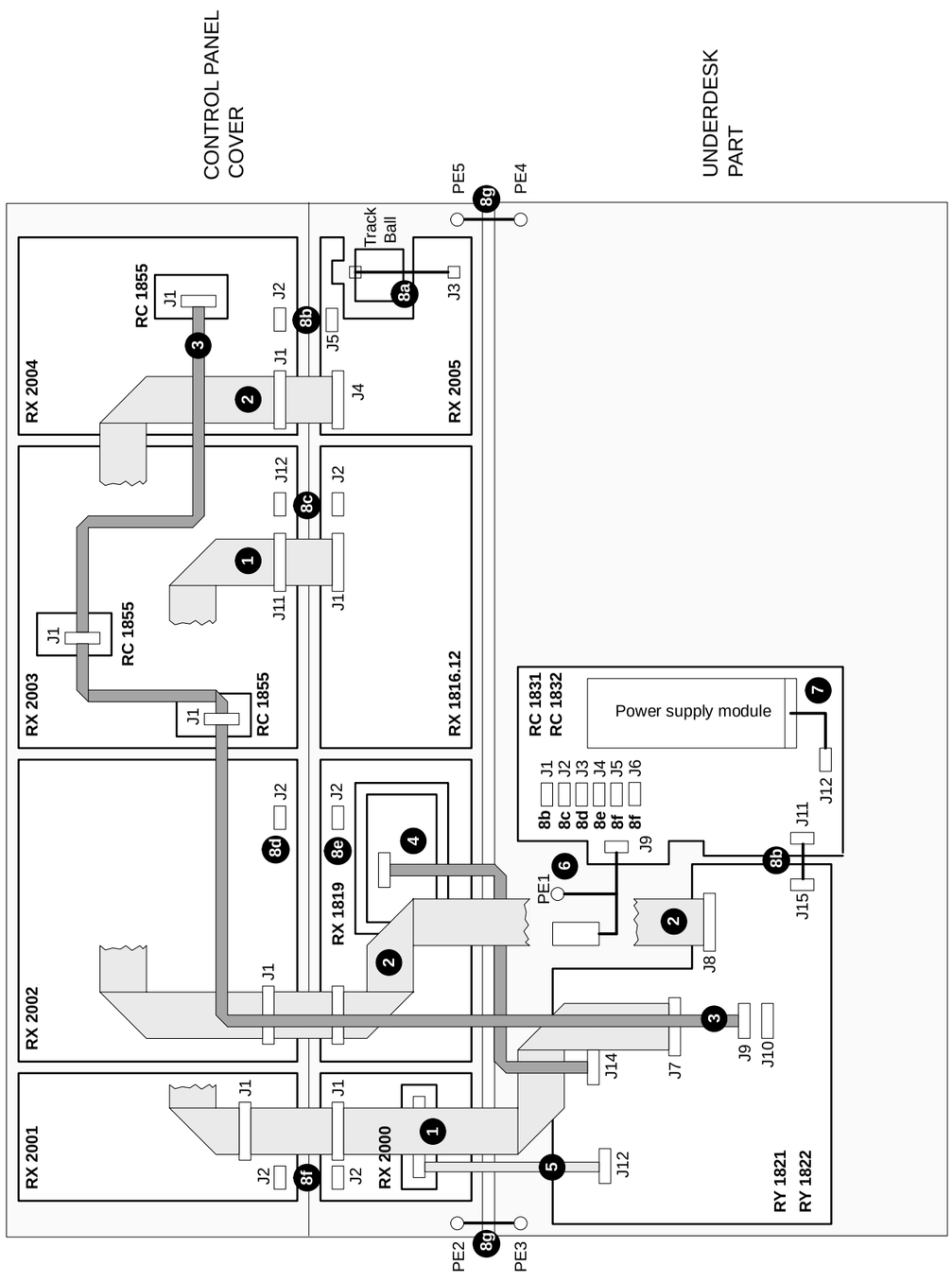
P.c. boards in control panel cover RPD 20





Leiterplatten in der Pultwanne RPD 20

Internal cabling RPD 20



1 = Flat cable 40-pin FB 694, order no.: 0 701 259 400

2 = Flat cable 40-pin FB 695, order no.: 0 701 259 500

3 = Flat cable 10-pin FB 693, order no.: 0 701 259 300

4 = Flat cable 10-pin FB 692, order no.: 0 701 259 200

5 = Flat cable disk drive

6 = Jumper set RC 1937 – line voltage cabling

7 = Jumper set RC 1938 – line voltage cabling

8 = Jumper set RC 2007
comprising:

8a = Connection cable (modular connector) 8-pin (trackball)

8b = DC voltage cabling (controller)

8c = DC voltage cabling (keyboards)

8d = DC voltage cabling (keyboard)

8e = DC voltage cabling (keyboard)

8f = 2x DC voltage cabling (keyboards)

8g = 2x earth cabling

3.4 CONTROL PANEL RPD 30

Control panel RPD 30 consists of a one-piece, plastic-coated, engraved plate and an underdesk part being connected with each other via two hinges. The keyboards are screwed to the engraved plate. The underdesk part contains the controller board required for control, the power supply as well as the connection unit for the electrical connections off the board. The p.c. boards in the underdesk part are located on a common bottom plate which can be taken out by loosening 6 fastening screws. The connector sockets are fixed-connected with the controller board.

Control desk RPD 30 with serial number 0 351 690 000 comprises the following subassemblies:

Type		Designation	Order number
Control panel cover			
RX 1800		Crossbar selection 1	0 351 690 100
incl.:			
RX 1804.11		LED display (14 digits)	0 351 690 500 *
RX 1801		Crossbar selection 2	0 351 690 200
incl.:			
RX 1804.12		LED display (13 digits)	0 351 693 400 *
RX 1802		Crossbar selection 3	0 351 690 300
incl.:			
RX 1804.11	2x	LED display (14 digits)	0 351 690 500 *
RX 1803		Crossbar selection 4	0 351 690 400
incl.:			
RX 1804.12	2x	LED display (13 digits)	0 351 693 400 *
RX 1806		Transition selection 1	0 351 690 700
incl.:			
RC 1853		LED display (1 digit)	0 351 660 400
RC 1854.11		LED display (4 digits)	0 351 660 500
RX 1807		Transition selection 2	0 351 690 800
incl.:			
RC 1853	2x	LED display (1 digit)	0 351 660 400
RC 1854.11	2x	LED display (4 digits)	0 351 660 500
RX 1811		Chromakey selection	0 351 691 200
incl.:			
RC 1853		LED display (1 digit)	0 351 660 400
RX 1812		EXTRA selection	0 351 691 300
incl.:			
RC 1805		LED display (2 digits)	0 351 690 600
RC 1853	2x	LED display (1 digit)	0 351 660 400
RC 1856		LED display (4 digits)	0 351 661 000
RX 1816.11		Wipe selection	0 351 691 700
incl.:			
RC 1825	2x	LED display (4 digits)	0 351 692 600
RX 1817		Mask selection	0 351 691 800
RX 1818		Memory selection	0 351 691 900
incl:			
RX 1804.11		LED display (14 digits)	0 351 690 500
RX 1819		Display selction	0 351 692 000
incl:			
RX 1804.12		LED display (13 digits)	0 351 693 400 *
RC 1858	4x	Fader assembly	0 351 661 200
incl:			
RC 1855		Connector panel	0 351 660 900
		Trackball	3 114 019 002

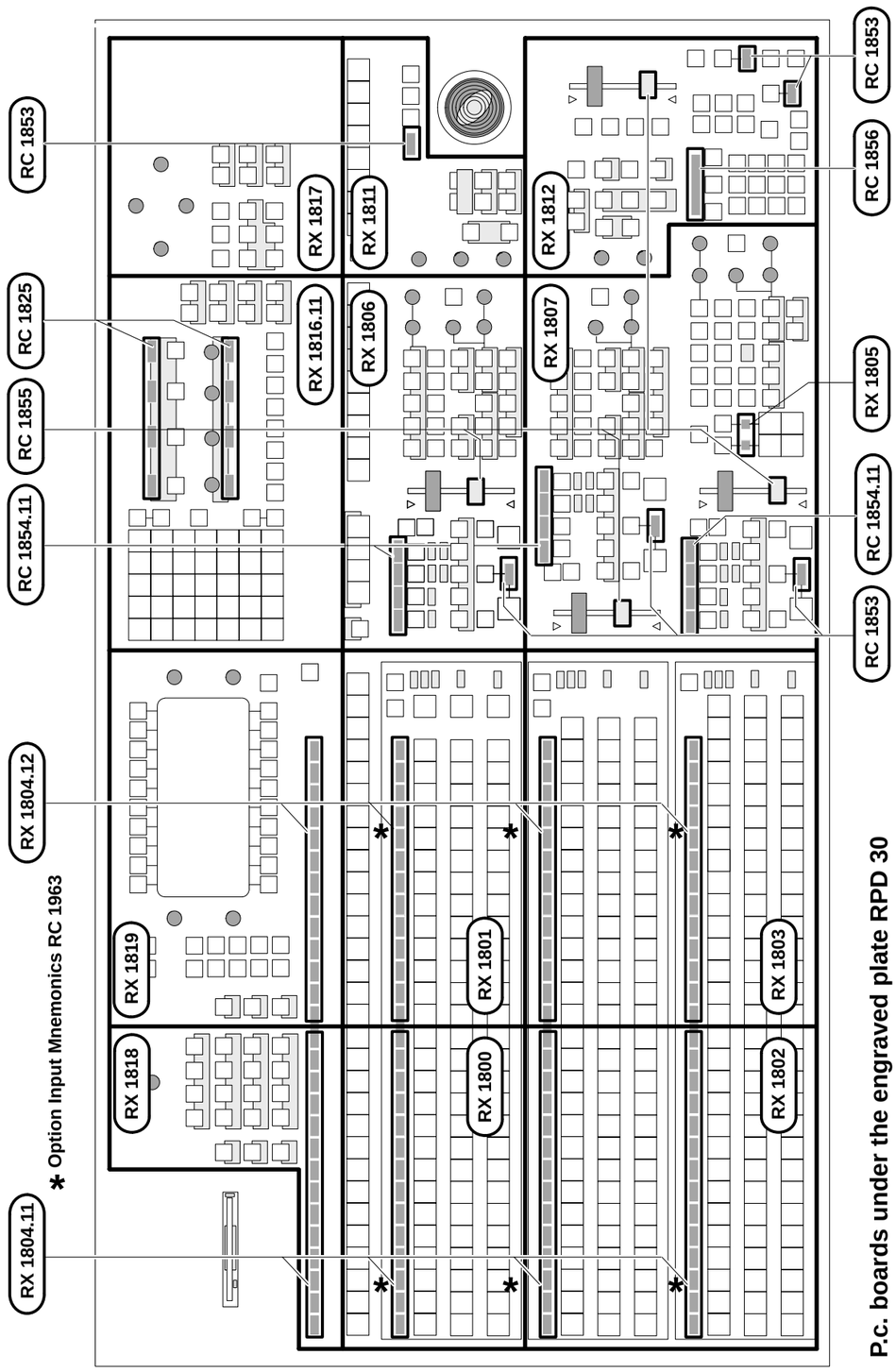
Underdesk part		
RY 1821 EGA RY 1822 VGA	Controller EGA (or) Controller VGA	0 351 692 200 0 351 692 300
RC 1831 redundant RC 1832	Power supply (or) Power supply	0 351 693 200 0 351 693 900
OPTIONS		
	PC-Mouse	3 114 019 010

* Option RY 1963 Input Mnemonics 0 212 187 800 (ex factory only!).

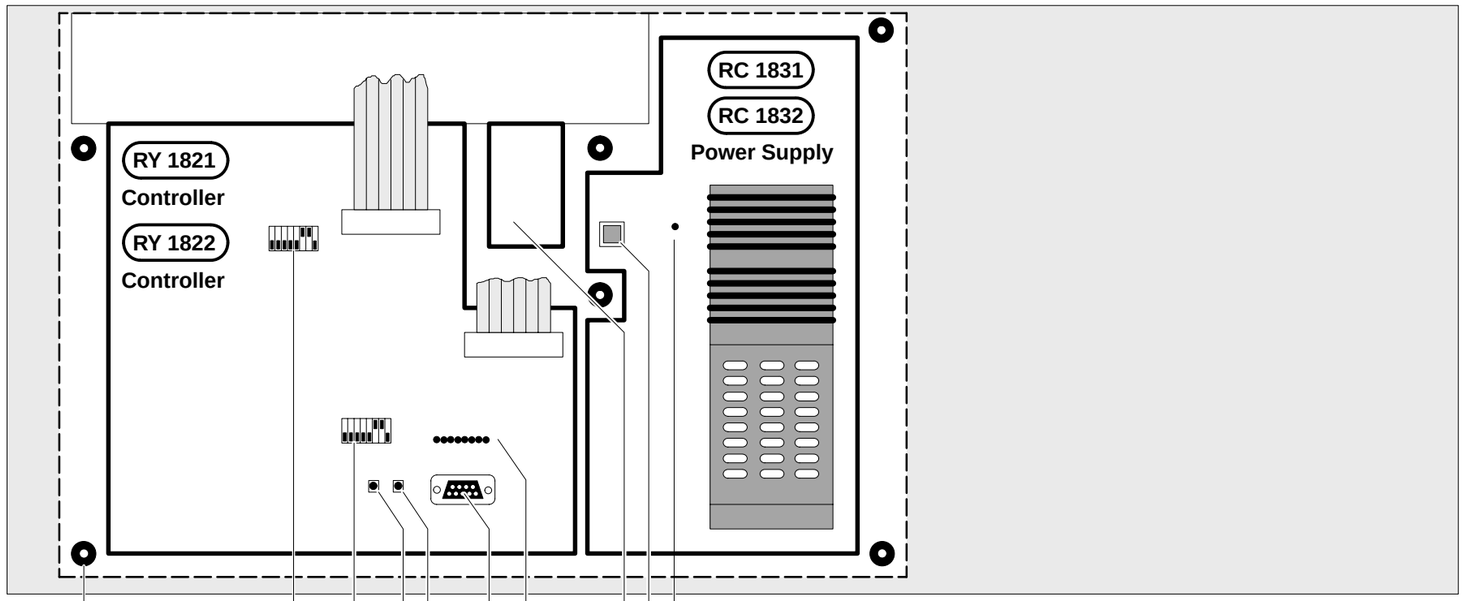
Opening the control panel

For opening the control panel, use a screwdriver or coin to unlock (in ccw direction) the four locking screws located at the right and left on the engraved plate. Two pneumatic springs enabled to easily lift up the control desk plate so the it can be hinged upwards. When opened, it is secured by the hinge. By a slight pressure, the control panel can be closed again.

Attention! Risk of squeezing when closing the control panel.



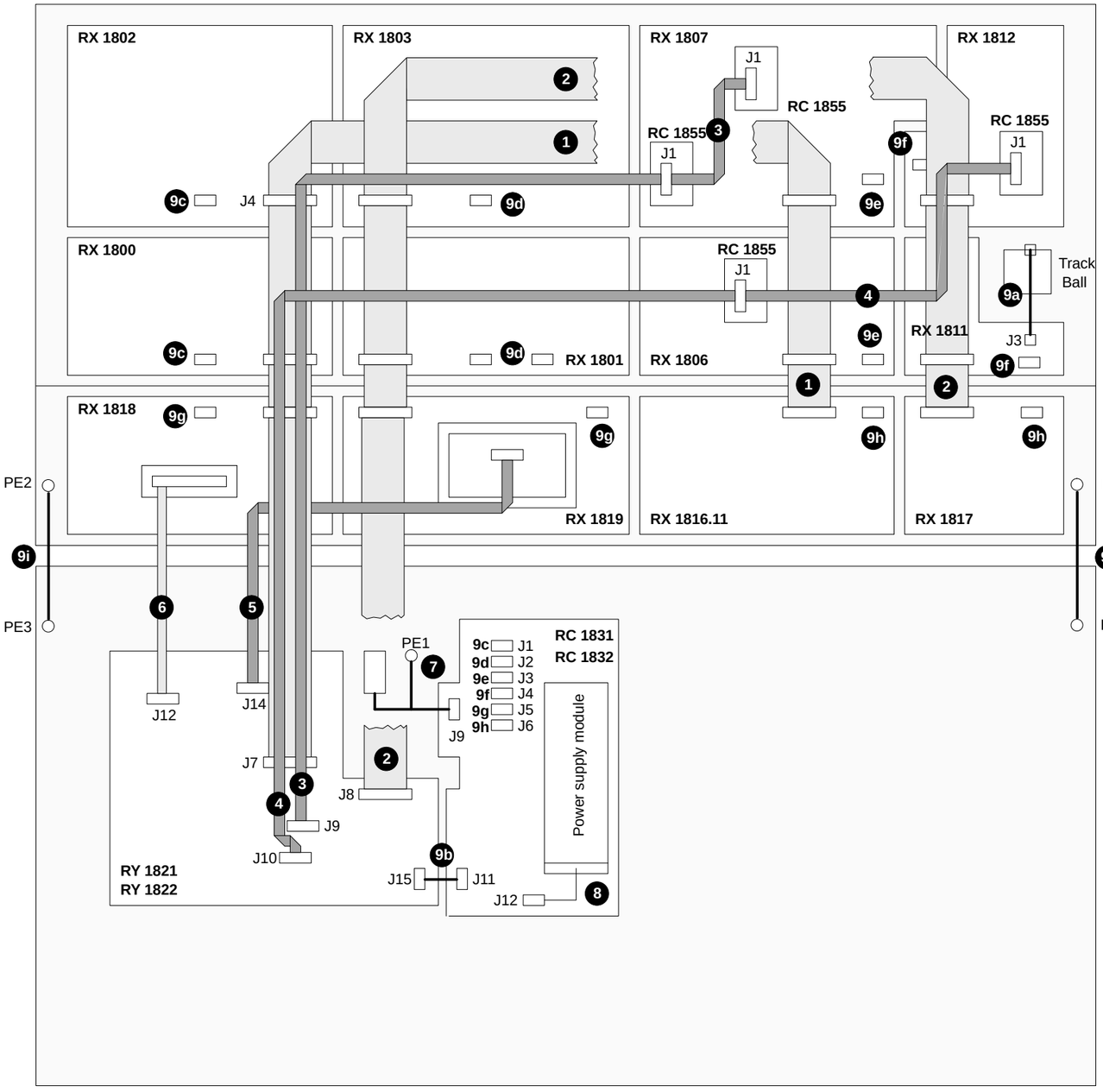
P.c. boards under the engraved plate RPD 30



LED: +5V OK
Netzschalter für Service
Netzfilter
Controller–Staus–LEDs
Anschlußbuchse SERVICE
Taste MONITOR
Taste RESET
DIL–Schalter
DIL–Schalter
Befestigungsmuttern (6x)
der gesamten Baugruppe

Leiterplatten in der Pultwanne RPD 30

Internal cabling RPD 30



1 = Flat cable 40-pin FB 684, order no.: 0 701 258 400
2 = Flat cable 40-pin FB 685, order no.: 0 701 258 500
3 = Flat cable 10-pin FB 683, order no.: 0 701 258 300
4 = Flat cable 10-pin FB 682, order no.: 0 701 258 200
5 = Flat cable 10-pin FB 681, order.: 0 701 258 100
6 = Flat cable floppy
7 = Jumper set RC 1937 – line voltage cabling
8 = Jumper set RC 1938 – line voltage cabling
9 = Jumper set RC 1833
consisting of:
9a = Connecting cable (modular connector) 8-pin (trackball)
9b = DC voltage cabling (controller)
9c = DC voltage cabling (keyboards)
9d = DC voltage cabling (keyboards)
9e = DC voltage cabling (keyboards)
9f = DC voltage cabling (keyboards)
9g = DC voltage cabling (keyboards)
9h = DC voltage cabling (keyboards)
9i = 2x earth cabling

3.5 CONTROL PANEL RPD 20M

Control panel **RPD 20M** consists of a plastic-coated, engraved plates and an underdesk part being connected with each other via two hinges. The keyboards are screwed to the engraved plate. The underdesk part contains the controller board required for control, the power supply as well as the connection unit for the electrical connections off the board. The connector sockets are fixed-connected with the controller board.

Control desk **RPD 20M** with serial number 0 351 720 000 comprises the following sub-assemblies:

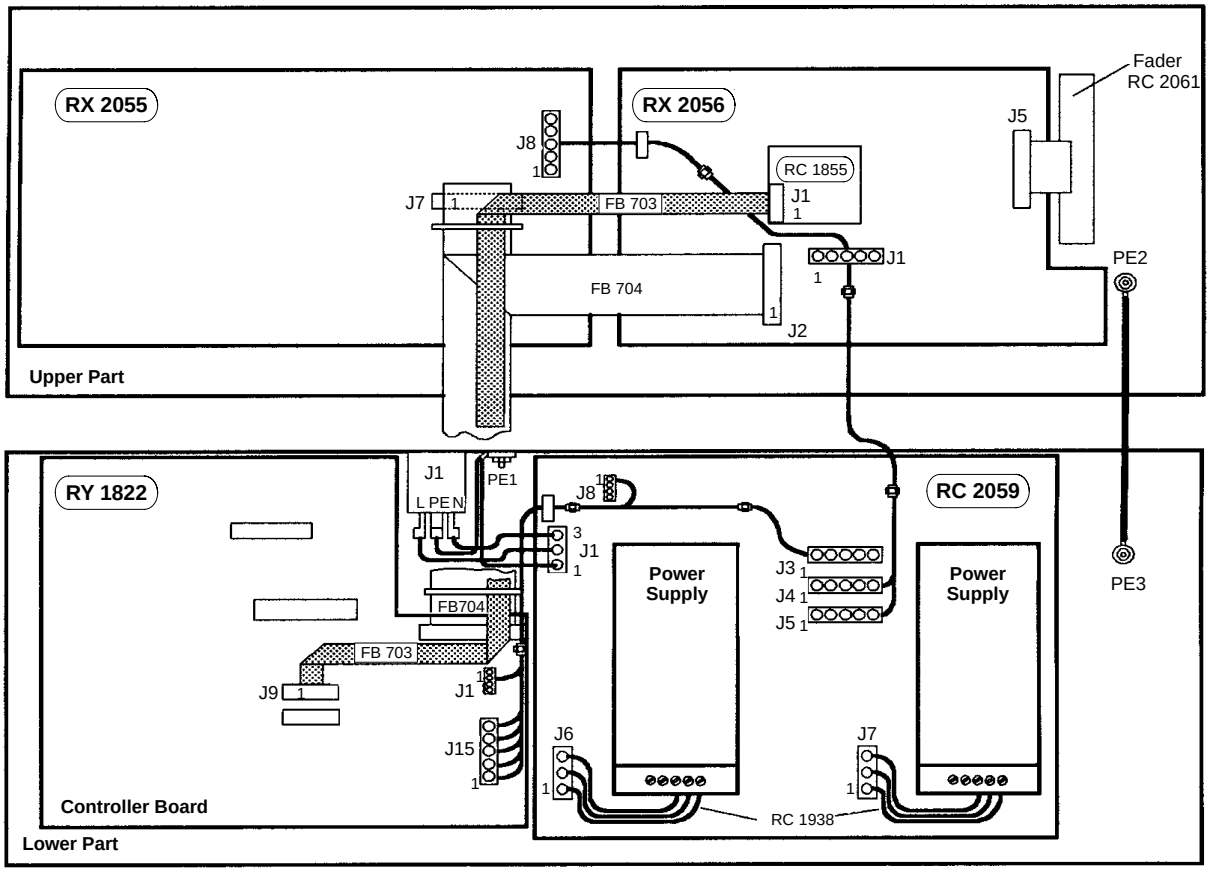
Type	Designation	Order number
Control panel cover		
RC 1858	Fader kpl.	0 351 661 200
RC 2061	Audio Fader kpl.	0 351 720 800
RX 2055	MCS Key Board 1	0 351 720 100
RX 2056	MCS Key Board 2	0 351 720 200
Underdesk part		
RY 1822	Controller Board	0 351 692 300
RC 2059	Power supply	0 351 720 500

Opening the control panel

For opening the control panel, use a screwdriver or coin to unlock (in ccw direction) the two locking screws located to the right and left on the engraved plate. Two springs enabled to easily lift up the control desk plate so the it can be hinged upwards. When opened, it is secured by the hinge. By a slight pressure, the control panel can be closed again.

Attention!

Risk of squeezing when closing the control panel.


RX 2055
RX 2056
Fader
RC 2061
J5
J8
RC 1855
J7
FB 703
J1
FB 704
J2
PE2
Upper Part
RY 1822
RC 2059
PE1
L PE N
Power
Supply
J3
J4
J5
PE3
FB704
J9
J15
J6
J7
RC 1938
Controller Board
Lower Part

3.6 ELECTRONICS BOX RMD 5 / RMD 10

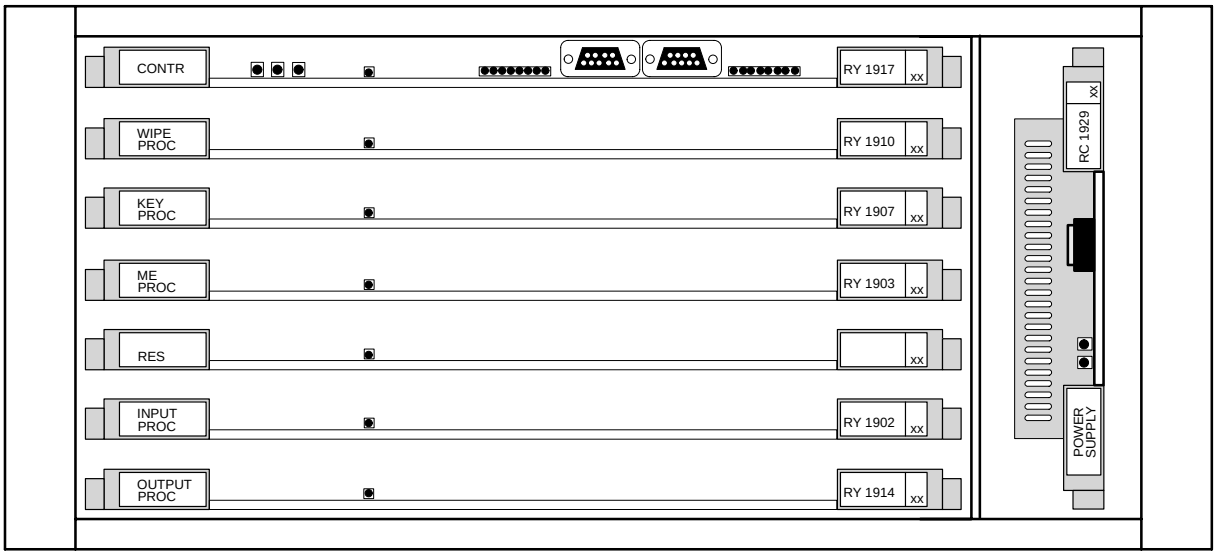
The electronics boxes RMD 5 and RMD 10 are located in one closed 19” frame each, containing the individual p.c. boards of the video and control electronics as well as the power supplies.

RMD 5

Electronics box **RMD 5** with order number 0 212 160 000 contains the following subassemblies:

Type	Designation	Order number
RY 1902	Input processor	0 212 180 300
RY 1903	ME processor	0 212 180 400
RY 1907 or RY 1906 (< 06.95)	Key processor 1 (without ChrKey) Key processor 1 (ChrKey)	0 212 180 800 0 212 180 700 *
RY 1943 (> 06.95) or RY 1944	Key processor 2 (ChrKey) Key processor 2 (without ChrKey)	0 212 184 400 0 212 184 500
RY 1910	Wipe processor	0 212 181 000
RY 1914	Genlock/output processor	0 212 181 500
RY 1917	Controller	0 212 181 800
RC 1919	Blower unit	0 212 182 000
RY 1922	Distribution board	0 212 182 300
RC 1925	Connector panel	0 212 182 600
RC 1929	Power supply	0 212 183 000
** OPTIONS (EX FACTORY)*		
RC 1968 incl.: RY 1906	DynaChrome key generator Key processor (ChrKey)	0 212 188 300 0 212 180 700

Electronics box RMD 10

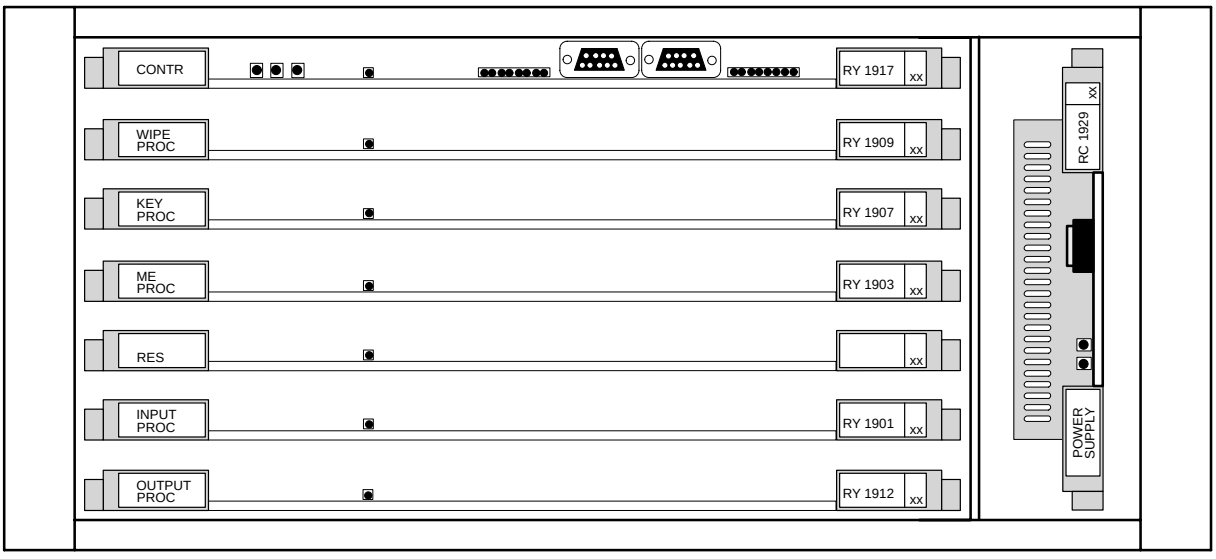


RMD 10

Electronics box **RMD 10** with order number 0 212 150 000 contains the following subassemblies:

Type	Designation	Order number
RY 1901	Input processor	0 212 180 200
RY 1903	ME processor	0 212 180 400
RY 1907 or RY 1906	Key processor Key processor (2x ChrKey)	0 212 180 800 0 212 180 700 *
RY 1909 or RY 1908	Wipe processor (1x WP) Wipe processor (2x WP)	0 212 181 000 0 212 180 900 *
RY 1912	Genlock/output processor	0 212 181 300
RY 1917	Controller	0 212 170 800
RC 1922	Distribution board	0 212 182 300
RC 1925	Connector panel	0 212 182 600
RC 1929	Power supply	0 212 183 000
RC 1919	Blower unit	0 212 182 000
** OPTIONS (EX FACTORY)*		
RC 1970-1 incl.: RY 1906	DynaChrome key generator Key processor (2x ChrKey)	0 212 188 500 0 212 180 700
RC 1971-1 incl.: RY 1908	2nd main wipe generator Wipe processor (2x WP)	0 212 188 600 0 212 180 900

Electronics box RMD 10



3.7 ELECTRONICS BOX RMD 20 / RMD 30

The electronics boxes RMD 20 and RMD 30 are located in one closed 19” frame each, containing the individual plug-in cards of the video and control electronics as well as the power supplies.

RMD 20

Electronics box **RMD 20** with the order number 0 212 170 000 contains the following subassemblies:

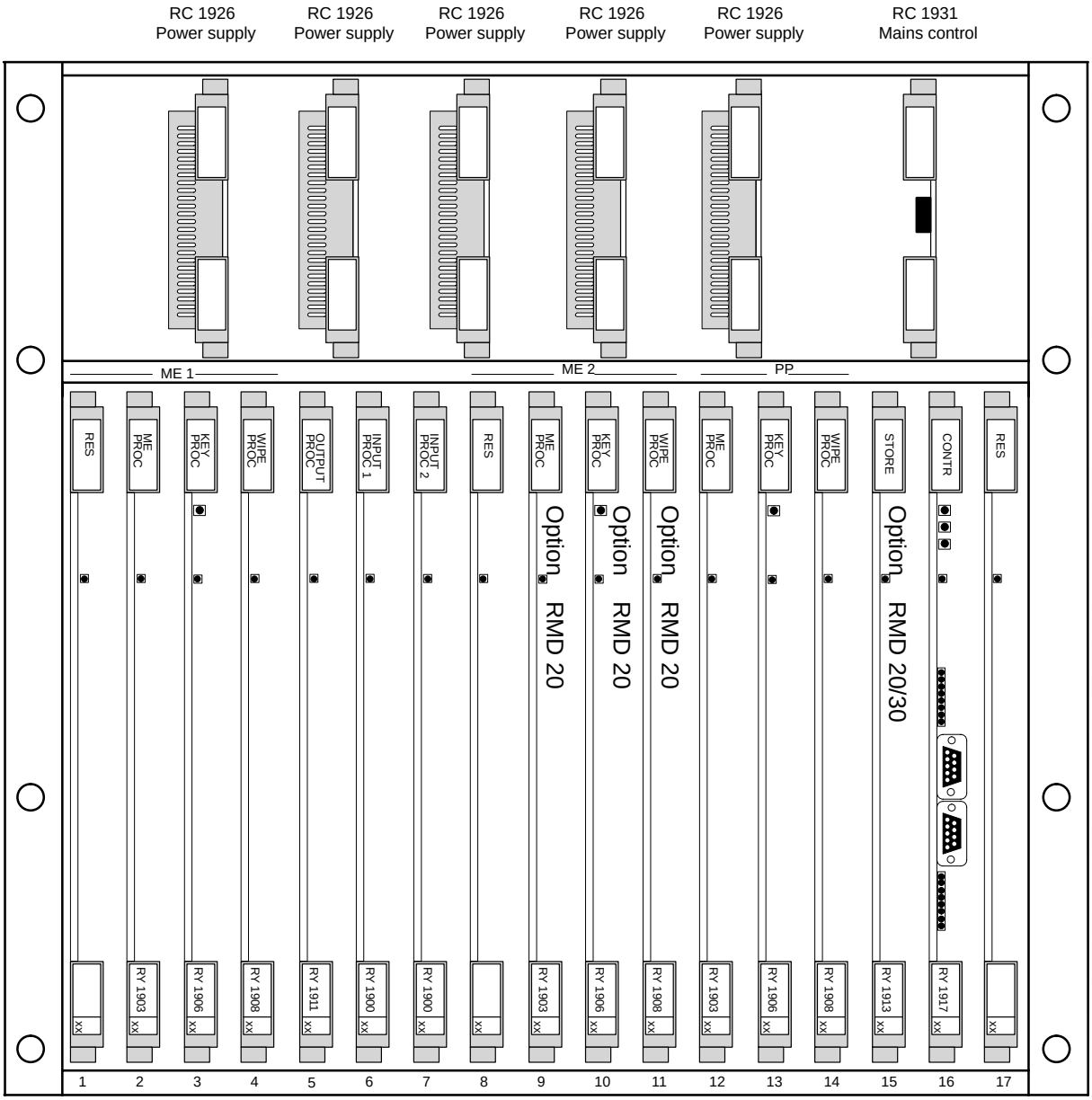
Type	Designation	Order number
RY 1900 2x	Input processor	0 212 180 100
RY 1903 2x	ME processor ME1/PP	0 212 180 400
RY 1907 2x	Key processor ME1/PP	0 212 180 800
RY 1909 2x	Wipe processor (1x WP) ME1/PP	0 212 181 000
RY 1916	Genlock/output processor	0 212 181 700
RY 1917	Controller	0 212 181 800
RC 1921	Distribution board	0 212 182 200
RC 1924	Connector panel	0 212 182 500
RC 1931	Mains control	0 212 183 200
RC 1926 5x	Power supply	0 212 182 700
RC 1920 incl. RC 1939 3x	Blower unit Blower	0 212 182 100 0 212 184 000
** OPTIONS (EX FACTORY)*		
RY 1913	Mounting frame store	0 212 181 400
RC 1928	Power supply 2	0 212 182 900
RC 1970-1 incl.: RY 1906	DynaChrome key gen. 1st ME Key processor (2x ChrKey)	0 212 188 500 0 212 180 700
RC 1970-3 incl.: RY 1906	DynaChrome key generator PP Key processor (2x ChrKey)	0 212 170 200 0 212 180 700
RC 1961 incl.: RY 1903 RY 1908	2nd ME stage ME processor Wipe processor (2x WP)	0 212 187 600 0 212 180 400 0 212 180 900
RC 1972 incl.: RY 1911	AUX bus extension Genlock/output processor (AUX-Ext.)	0 212 188 700 0 212 181 200
RC 1971-1 incl.: RY 1908	2nd main wipe generator (1st ME) Wipe processor (2x WP)	0 212 188 600 0 212 180 900
RC 1971-3 incl.: RY 1908	2nd main wipe generator (PP) Wipe processor (2x WP)	0 212 170 400 0 212 180 900

RMD 30

Electronics box **RMD 30** with the order number 0 212 180 000 contains the following subassemblies:

Type	**Designation**	Order number
RY 1900 2x	Input processor	0 212 180 100
RY 1903 3x	ME processor ME1/ME2/PP	0 212 180 400
RY 1907 3x	Key processor ME1/ME2/PP	0 212 180 800
RY 1909 3x	Wipe processor ME1/ME2/PP	0 212 181 000
RY 1916	Genlock/output processor	0 212 181 700
RY 1917	Controller	0 212 181 800
RC 1921	Distribution board	0 212 182 200
RC 1924	Connector panel	0 212 182 500
RC 1931	Mains control	0 212 183 200
RC 1926 5x	Power supply	0 212 182 700
RC 1920	Blower unit	0 212 182 100
incl. RC 1939 3x	Blower	0 212 184 000

** OPTIONS (EX FACTORY)*		
RY 1913	Mounting frame store	0 212 181 400
RC 1928	Power supply 2	0 212 182 900
RC 1972	AUX bus extension	0 212 188 700
incl.: RY 1911	Genlock/output processor (AUX-Ext.)	0 212 181 200
RC 1970-1	DynaChrome key gen. 1st ME	0 212 188 500
incl.: RY 1906	Key processor (2x ChrKey)	0 212 180 700
RC 1970-2	DynaChrome key gen. 2nd ME	0 212 170 100
incl.: RY 1906	Key processor (2x ChrKey)	0 212 180 700
RC 1970-3	DynaChrome key generator PP	0 212 170 200
incl.: RY 1906	Key processor (2x ChrKey)	0 212 180 700
RC 1971-1	2nd main wipe generator (1st ME)	0 212 188 600
incl.: RY 1908	Wipe processor (2x WP)	0 212 180 900
RC 1971-2	2nd main wipe generator (2nd ME)	0 212 170 300
incl.: RY 1908	Wipe processor (2x WP)	0 212 180 900
RC 1971-3	2nd main wipe generator (PP)	0 212 170 400
incl.: RY 1908	Wipe processor (2x WP)	0 212 180 900


RC 1926 Power supply
RC 1926 Power supply
RC 1926 Power supply
RC 1926 Power supply
RC 1926 Power supply
RC 1931 Mains control
ME 1
ME 2
PP
RES
ME PROC
KEY PROC
WIPE PROC
OUTPUT PROC
INPUT PROC 1
INPUT PROC 2
RES
ME PROC
KEY PROC
WIPE PROC
ME PROC
KEY PROC
WIPE PROC
STORE
CONTR
RES
Option RMD 20
Option RMD 20
Option RMD 20
Option RMD 20/30
RY 1903 xx
RY 1906 xx
RY 1908 xx
RY 1911 xx
RY 1900 xx
RY 1900 xx
xx
RY 1903 xx
RY 1906 xx
RY 1908 xx
RY 1903 xx
RY 1906 xx
RY 1908 xx
RY 1913 xx
RY 1917 xx
xx
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

3.8 ELECTRONICS BOX RMD 20M

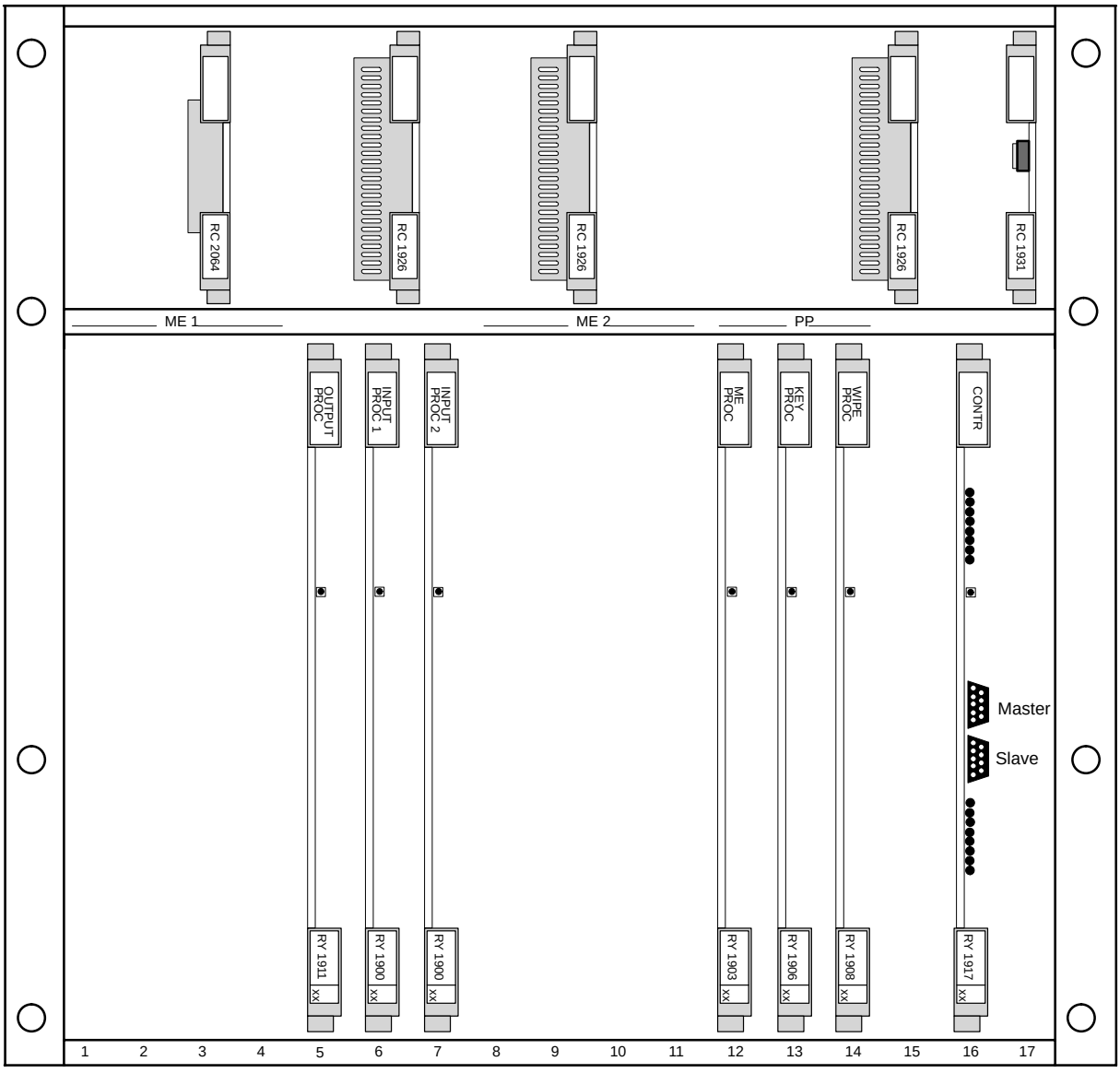
The electronics of the master control switcher is located in one closed 19” frame, containing the individual plug-in cards of the video and control electronics as well as the power supplies.

RMD 20M

Electronics box **RMD 20M** with the order number 0 212 210 000 contains the following subassemblies:

Type	Designation	Order number
RY 1900 2x	Input processor	0 212 180 100
RY 1903	ME processor ME1/PP	0 212 180 400
RY 1944	Key processor 2	0 212 184 500
RY 1911	Genlock/output processor	0 212 181 200
RY 1917	Controller	0 212 181 800
RC 1921	Distribution board	0 212 182 200
RC 1924	Connector panel	0 212 182 500
RC 1931	Mains control	0 212 183 200
RC 1926 3x	Power supply	0 212 182 700
RC 1939	Blower	0 212 184 000
RC 2064	Blower board kpl	0 212 210 800

Elektronik-Box RMD 20M



3.9 CONTROL PANEL CONTROLLER RY 1821 / RY 1822 AND KEYBOARDS

The control panels of the switcher types DD 5/10/20/30 are all equipped with Controller board RY1821.
A separate description of the keyboards is not required because the principle of keyboard and adjustment inquiries as well as of the system return information are described in this section.

MICROCOMPUTER KERNEL

The microcomputer bases on a 80C186 CPU (central processing unit). The 80C186 CPU is an ”embedded controller”, i.e. beside the proper microprocessor (16-bit), a series of peripheral functions are integrated on the chip.

These functions mainly are:

– Interrupt controller
– DMA controller
– Timer/counter
– Chip-select unit
– Waitstate generator

The CPU is supplied from the oscillator with a 40-MHz clock, thus obtaining a system clock of 20 MHz (internal division by 2). Via a counter, further clocks for other system components are obtained by division.

Address and data bus

On the local bus MUXAD<20..0>, addresses and data are transferred in the time multiplex mode. The address is available at the outputs of the address latches in demultiplexed form and buffered (bus ADR<19..0>). Data bus DAT<15..0> is buffered via the bus tranceivers.

The 80C186 microprocessor differentiates between word (16-bit) and byte (8-bit) transfers. Byte transfers under even addresses are made via the data bits D7...D0, those under odd addresses via D15 ... D8.

The transfer type is encoded in the signals A0 (address 0) and BHE* (bus high enable):

Microcomputer kernel

Transfer type	BHE*	A0	
Byte, even address	1	0	
Byte, odd address	0	1	
Word, even address	0	0	
Word, odd address	–	–	(*)

(*) A word transfer to an odd address is split into two byte transfers.

The microcomputer write or read pulses (’WR*’, write or ’RD*’, read) are gated via the OR gates with the control signals BHE* or A0. The outputs of these gates can become active (low) only when both inputs are active (low). Thus, depending on the transfer type, either only one component or both ones are selected within a defined bank.

STORE

The 80C186 microprocessor comprises 20 address lines (A19...A0). Thus, the addressable storage area amounts to 2^{20} bytes = 1MByte.

This address space is divided up as follows:

Address:	Block size:	Store type:	Pos.no.
E0000H...FFFFFH	128 k	Eprom	(V59, V60)
60000H...DFFFFH	512 k	Flash	(V54, V55)
20000H...5FFFFH	256 k	Flash	(V50, V51)
00000H...1FFFFH	128 k	Ram	(V47, V48)

Address decoder

The programmable logic component PL914 contains the address decoder which gegenates the selection signals (bus MEMCS<3..0) for all storage elements. The signals are derived from gating the most significant address bits A19...A17 and the status signal S2*.

EPROM

The EPROM bank contains a minimal system (operating system) which can be operated without flash part. Furthermore, the EPROM contains all software modules required for loading the flash memories.

These are:

– the flash programming algorithmus
– a communication software (’Kermit’) for programming via the diagnostic interface
– the network software for programming via Cheapernet

Flash memory

The flash memories contain the real switcher operation software. These components can be electrically cleared and programmed. Software updates which only refer to this part, can be performed ”in-system”, i.e. without removing the microcomputer out of the plug-in frame. Programming is made either via the diagnostic interface of a PC, or via the network from a control panel with floppy disk drive (see the documentation ”Software-Updates”).

For clearing or programming, apply a programming voltage VPP of 12 V. These voltage is generated with DC/DC converter V49 from the 5V supply voltage. Via a transistor, the programming voltage can be switched on and off under software control. In the off-state, these components can be only read, i.e. they are write-protected.

Only half of the flash bank is faded into the address space. The other half can be activated by switching over the UPBNK signal.

Battery buffered RAM

The RAM components V47 and V48 are battery-buffered, i.e. their contents will be stored even in case of power failure. If power fails, these components are supplied by lithium cell T11. The monitoring component V70 supplies the signal LL* (low-line, active ”low”). With sufficient supply voltage, this signal is in the high state, the chip-select input CE2 enables the RAMs. If Vcc falls below a threshold value of approx. 4.8 V, LL* becomes low, the RAMs are write-protected – independent of the state of the primary chip-select input.

The supply voltage of the RAMs in the off-state is approx. 3 V. The buffer operates correctly down to a VBACK voltage of approx. 2 V.

The supply current in the off-state is in the microampere range. The cell has a capacity of 500mAh (milli-Ah), this means a life time of several years.

Cell T4 cannot be re-charged.

SUPERIOR SYSTEM CONTROL

Service interface

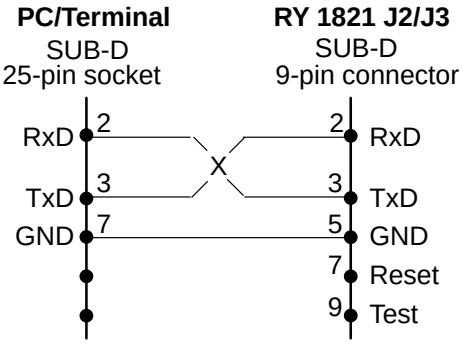
Microcomputer RY 1821 is includes with a service interface with interface RS232. This interface is accessible on the connection unit at the ”Service” socket (RY 1821 J2) as well as in the underdesk part at socket J3.

Attention:

The pins 7 and 9 of the connection cable must not be connected with the PC/terminal. In dependence on the logic level, this might lead to a permanent reset or to the start of the monitor program.

The two terminal sockets on RY 1821 or on the connector panel must not be connected with PCs and/or terminals at the same time.

Connection cable:



The diagnostic interface (channel B of interface component V44) can be optionally controlled by a computer mouse instead of a terminal/PC (socket J1, MOUSE). The mouse replaces on the D5 panel the trackball, but on other panels it can also be used alternatively or together with the trackball. Please note that the service interface operates only when it has be switched on explicitely (see the section ”RS232/Mouse Interface”). In this case, a mouse possibly connnected to J1 does then not operate.

Power-up, watchdog and reset

The microcomputer monitoring circuit V10 generates a defined reset pulse during increase of the 5V supply voltage (power-up phase) and after voltage breadowns.

Furthermore, a reset pulse is generated after the procedure of the integrated watchdog is terminated: if the microcomputer is in a controlled operation, the watchdog timer is constantly retriggered, i.e. under normal circumstances it never stops counting. If the trigger pulse is missing for more than approx. 1.6 s, a reset is generated automatically.

Furthermore, a reset can be initiated manually via the service interface J2,J3/pin2, or with key T9 (see Supplement 30): normally, Schmitt trigger input V71/pin3 is connected via pull-up resistor R170 and R174 at Vcc. Actuating key T9 effects fast discharging of capacitor C96/C97 via R171, and output V72/pin10 becomes active low. After releasing T9, C96/C97 is slowly charged via R170. When reaching the

switching threshold of V71, output V72/pin10 becomes high again. The time constant amounts to approx. 0.2 s. Diode G9 effects a fast discharging of C96/C97 even at a short-time voltage breakdown.

Monitor key

Key T10 enables entering a special monitor program:
For this purpose, hold the key down while performing a reset. The terminal periodically displays characters, the software then expects entering an ”U”. By means of this character, the baud rate of the terminal is automatically found. Subsequently, the prompt of the monitor program is displayed. This program is a simple aid for software development, as well as for hardware trouble shooting. While the computer is in the monitor mode, the red error LED G1 is blinking. If, after the monitor program was started, no character is entered to the terminal, the main program is automatically entered after some seconds. The monitor mode can be also activated via the diagnostics cable (Connected with Service interface J2/J3, see also Supplement 30).

LOCAL-AREA NETWORK

The units of the Philips switcher family are connected via a local network. The local-area network (LAN) interface comprises a set of three chips:

LAN coprocessor V42 is an intelligent peripheral component which handles the complete transmit and receive process of data blocks (frames) via a network. Memory accesses are made via the multiplexed address/data bus MUXAD<20..0. In this case, the coprocessor takes over the local bus, setting the CPU in the HOLD state and generating the bus control signal by itself. During the coprocessor cycles, the LAN LED is switched on.

The Ethernet serial interface (ESI, V36) is mainly charged with encoding/decoding the data from/into a special code (Manchester code).

The coaxial transceiver interface (CTI, V29) is a coax cable bus driver/receiver for 50-ohm coax networks.

The potential separation required for networks, is made on the signal side via transmitter L1 and on the supply side via DC/DC converter V26. The latter one generates from the 5V input voltage (Vcc) a potential-free output voltage of - 9 V.

REMOTE INTERFACES

RS422 interface

Connector J4 provides a serial interface in conformity with the RS422 standard. This interface is suitable to connect external units, such as under-monitor displays or similar. The bus drivers/receivers are connected with channel A of the serial interface component V44.

Bus driver V5 is configurated as RS422 driver by connecting pin 4 (MODE) to GND. The driver can be switched via pin 3 (signal RS422EN*, active low) into the high-resistive state. The capacitors C16 and C17 limit the rise time of the signal edges on the outputs, thus avoidung reflections on the interface cables.

Receiver component V6 converts the push-pull interface signals again into TTL signals. Resistor R30 effects a line termination which avoids refelections especially at long cables. Via resistor R29, a low offset current is fed into the receiver differential amplifier. This current effects that, in the event of an open or shorted line, an applicable level is obtained at the output in any case (fail-safe connection).

The pin assignment of J4 is configurated as a bus controller in conformity with EBU/SMPTE.

RS232/mouse interface

Channel B of serial interface component V44 including the RS232 interface, can be optionally switched with the relays T2 and T3 to service interface J2/J3 or to mouse interface J1. Switchover is made under software control via the MOUSEON signal. An activated mouse interface is indicated by means of LED G6.

Power supply of the mouse is made via R41 at J1/pins 4, 7 using the second RS232 bus driver.

At some mouse types, the supply voltage (approx. 12 V) lies at pin 8. The presence of a mouse is indicated via J1/pin 8, voltage divider R39/R40, as well as Schmitt trigger V71/a with the MOUSEDET* signal.

Other mouse types do not supply any voltage at pin 8, they can be only recognized by means of the software.

KEYBOARD INTERFACE

Each control panel module is connected to the microcomputer either via a flat cable with connector J7 ('Keyboard Low') or J8 ('Keyboard High'). Via these two interfaces, 8-bit data each can be transmitted to or from the the modules. The data bits of J7 (XD00..XD07) correspond with the data bits D00..D07 of the microcomputer, those of J8 (XD08..XD15) with D08..D15. Access can be made byte-by-byte (8 bits) or word-by-word (16 bits). In dependence on that, a clock pulse (XL/HCP*) is generated on one of the two interfaces or on both ones simultaneously.

Control signals of the keyboard interface(s):

XL/HQCLK : Quadrature clock, 5 MHz clock for the quadrature decoders.
XL/HRES* : Reset signal for the quadrature decoders, active "low".
XL/HPWRUP* : Power-up, disabled during the power-up phase the LED drivers.

XL/HDTR* : Data transmit/receive, indicates the transfer direction.
0 : Keyboard —> Microcomputer
1 : Microcomputer —> Keyboard

XL/HPS* : Parallel/serial, indicates the transfer type.
0 : serial, shift register I/O, LED displays (write-only)
1 : parallel, quadrature decoder (read-only)

XL/HDEN* : Data enable, enable signal for the data bus drivers/transceivers on the keyboard modules, active "low".

XL/HCP* : Clock pulse, data transfer pulse, data are transferred during the low phase, or shifted with rising edge.

The addresses XL/HA1..XL/HA7 correspond with the microcomputer addresses ADR01..ADR07. All pulses concerning shift registers or LED displays, are generated by means of a decoder (HCT138T) from gating the (buffered) signals BCP*, BPS* and a combination of the addresses BA1..BA3. The base address for these transfers (XL/HPS* "low") lies in the I/O address space at 8000H. The control signals for the quadrature decoders are obtained from gating the BPS* signal with the most-significant address bits. The base address for these transfers (XL/HPS* "high") lies in the I/O address space at 8800H.

Operating mode keyboard

Each keyboard contains a number of output shift registers (serial-in/parallel-out with integrated output latch, type HCT4094T) and an input shift registers (parallel-in/serial-out, type HCT165T), all being cascaded.

Each LED is controlled by a bit of an output shift register (HCT4094T) which is buffered by a lamp driver (open-collector type ULN2003 or discrete transistor). A logic 1 in the corresponding register is shown by a lighted LED.

Each key contact (maker) is connected with a bit of a read-in shift register (HCT165T) as well as a pull-up resistor. An inactivated key (contact opened) supplies at the corresponding input a logic 1, since only the pull-up resistor is effective. An activated key (contact closed) supplies a logic 0 at the corresponding input.

Data are either transmitted from the microcomputer to the LED registers (HCT4094T) (write cycle) or read from the KEY registers (HCT165T) into the microcomputer (read cycle).

Data transfer from microcomputer to keyboard:

With every write cycle, the microcomputer creates data which are shifted by a clock pulse SCP0/1/2* by one bit into the peripheral register chains (consisting of components, type HCT4094T). Data transfer is made via the bidirectional bus transceiver BCT245DW which is connected in this case in write direction. After the last shift cycle, a strobe pulse is generated which transfers the data from the shift registers to the integrated output latches.

Data transfer from keyboard to microcomputer:

First, an input strobe pulse STBI* is generated which transfers the input information to be read (keys) to the shift registers (components, type HCT165T). With every read cycle, data are transferred from the end of the register chains via the bus driver BCT541DW to the bidirectional data bus. Simultaneously, a shift clock pulse SCP0/1/2* is generated which shifts the register contents forwards by one bit. The enable signal for the bus driver is obtained by gating the (buffered) signals BDEN*, BPS* and BDTR* with one of the three address bits (page selection) BA1..BA3.

The use of three separate shift pulses enables control of up to three different register chains (pages, see below) with one data bit.

From the I/O base address (see above) and the offsets (BA3..BA1), the I/O addresses are obtained as follows:

8000/1 : output strobe, data are transferred from the shift registers to the output latches (write-only).
8002/3 : shift clock page 0, register contents of all SR within page 0 are shifted forwards by one bit (read/write).
8004/5 : shift clock page 1, register contents of all SR within page 1 are shifted forwards by one bit (read/write).
8006/7 : input strobe, state of the keys is transferred to the shift registers (write-only).
8008/9 : shift clock page 2, register contents of all SR within page 2 are shifted forwards by one bit (read/write).

Address nomenclature

To each register is assigned one clear logic address (not to be mixed up with hardware port addresses). This address is composed of the following parameters:

1. Data bit (chain) to which the corresponding register chain is connected
2. Page being occupied by this board (depends on which of the three shift clock pulses controls the registers)
3. Register number (place were this register is located within the chain)

In the following text, the registers or the corresponding addresses are named PUT (write direction) and GET (read direction). Contrary to this, parallel registers or their addresses are addressed with INPUT and OUTPUT (DICMAC convention).

The register indices of the PUT registers are counted in shifting direction of ”0” in ascending order, starting from the bus coupling (data bit). The register indices of the GET registers are counted opposite to the shifting direction of ”3” in descending order, starting from the bus coupling.

Range:

chain : 0 ... F (15, hexadecimal)
page : 0 ... 2
register: 0 ... 2

Applicable logic addresses: 000 ... F22

Each of the three pages can contain up to three PUT and GET registers which have the following indices:

PUT register: GET register:

——> cp0—>cp1—>cp2—>cp2—>cp1—>cp0
Bus<————————————————————————

”p” becomes 0, 1, or 2 in dependence on the employed shift clock
”c” becomes 0 ..... F in dependence on the employed data bit

Please note that not all logic register addresses have a pendant in the hardware.

Keyboard brightness

On each of the keyboards, a constant voltage VCOM is generated by means of a negative voltage regulator, type LM337T. This voltage is applied to pin 9 of the lamp driver components, type ULN2003AD. Via internal diodes, a current bypasses the reals switching transistor (open-collector) and is fed via the connected LED, thus generating a defined brightness. The hight of this current – and thus the brightness – depend on the voltage VCOM. The input voltage XVREF (pin 35 at the 40-pin bus interface) enables adjusting the hight of VCOM via a resistor network acting on the reference input of the voltage regulator. The voltage Vref is generated by means of a DA converter on the microcomputer (see the section ”DA Converter”).

Operating mode LED display

The control signals relevant for the LED displays are also obtained from the above-mentioned decoder HCT138T

Control of the LED displays DLG1414 by the microcomputer is made by two successive write cycles. Data transfer is made via the bidirectional bus transceiver BCT245DW which, is switched in this case in write direction. In the first cycle, the digit address is read out. It is buffered with the clock pulse SDA* in a register HCT574T. The two least significant register bits represent the digit address (1-out-of-4 digits) within each display. The most significant address bits represent the display address (1-out-of-N displays). In the second cycle, the real digit data are read out. These are ASCII characters. The write pulse for the displays is generated by gating the most significant address bits with one of the two data transfer pulses SDD0* or SDD1*. Thus, by differentiating the data address, two different digits can be controlled under the same digit address.

From the I/O base address (see above) and the offsets (BA3..BA1), the I/O addresses are obtained as follows:

800a/b : digit data 0, writing ASCII data into the first digit addressed by the digit address (write-only).

800c/d : digit data 1, writing ASCII data into the second digit addressed by the digit address (write-only).

800e/f : digit address, storing the number of the digit to be written in registers (write-only)

Operating mode trackball/digipot interface

The digipots as well as the trackball (x and y channel) supply each two so-called quadrature-encoded signals A and B. These are rectangular signals in phase quadrature. Evaluation of these signals is made with quadrature decoder HCTL2000. This component accumulates the increments/decrements (in dependence on the direction of rotation) with an internal 12-bit counter. An internal digital filter is charged with the debouncing of the input signals. This filter, as well as the internal position counter operate with the clock signal XL/HQCLK.

Reading of the internal 12-bit position counter is made in two successive cycles via the bidirectional bus transceiver BCT245DW which is switched in this case in reading direction. Input SEL which is connected with the (buffered) address BA1, selects the most significant byte (BA1 0) or the least significant byte (BA1 1).

Selection of the components is made via comparator HC85T which decodes a continuous block from the address space by comparing most significant addresses (inputs A3..A0) with a defined bit pattern (inputs B3...B0). The comparator output signal serves on the one hand as an input variable for transceiver control (generating PDEN* in HCT139T), and on the other hand as an enable signal for further decoders HCT138T. The decoders generate the enable signals (output enable, OE*) for HCTL2000 by decoding the least significant address bits.

FADER/AD CONVERTER

Voltage regulator V57 generates an output voltage VFREF of approx. 3 V which serves as a regulated supply voltage for the fader potentiometers, as well as a reference voltage for the 12-bit AD converter V52. The analog voltages supplied by the faders, are fed from J9 or J10 via the R-C elements R132/C82, R131/C81, etc. to the inputs of V52. V52 contains a programmable sequencer being loaded in the initializing phase with a sequence of commands which after a start command, converts four channels and stores the results in an internal FIFO.

The component operates with a CLKDAS clock of 5 MHz being obtained from the system clock by division in V43.

EL DISPLAY CONTROLLER

The display controller mainly consists of clock oscillator T1, the real display controller V7, address latch V11/V15, frame store RAM V13/V16 and shift register V27/V28.

The control signals required for communication between CPU and display controller V7, are generated in the programmable logic component V9. When accessing V7, the bus cycle has to be extended by several clocks. Via the SRDY signal, the CPU gets the information that a certain number of wait states has to be added to the momentary cycle.

Display controller V7 builds up the picture information in the RAM components V13 and V16. Bus MAD<15..0 is a multiplexed, bidirectional bus on which data as well as addresses are transferred. The addresses are buffered with the AS pulse (address strobe) in the latches V11/V15. Data are read out by controller V7 from the RAM, modified and written back into the RAM (read-modify-write).

The EL display (or also a monitor) is serially controlled with data (i.e. picture information) and has to be cyclically refreshed. For this purpose, data are read out of the RAM word-by-word (16 bits) and serialized with shift register V27/V28. Synchronization of the display/monitor is made via horizontal and vertical pulses. The complete timing is derived from the 16-MHz pixel clock generated in T1. Controller V7 operates with the pixel clock 2CLK divided by two.

At the EL display interface J14, data clock and sync pulses are available in a bufferd form. With each rising edge of BCKD, a pixel is shifted into the display electronics. A ”1” in the data stream generates a lighting pixel, a ”0” a dark pixel.

J13 enables connection of an RGB monitor in conformity with the EGA standard. Controller V7 geneates a cursor in form of H and V components (CUD1* and CUD2*). From these two components, a composed CURSOR signal is generated in V23. From the display information (ELDIN) and the cursor information (CURSOR), a bit pattern is generated inV19 representing one color out of 64 colors. The respective colors can be configurated with DIP switch T4. This bit pattern and the sync pulses are buffered with V18.

The cursor is not visible on the EL display.

FLOPPY DISK CONTROLLER

The single-chip floppy disk controller V4 contains all switching parts required for operation of a floppy disk drive. The chip operates with a clock of 24 MHz generated in oscillator T5.

The chip itself assists different drives, in the switcher control panels however, only 3.5’’ drives are assisted. The internal drive (D10, D20 only) is directly connected to connector J12. Connector J11 for the external drive (option) is decoupled via the buffers V1 or V2. They enable connection of the external drive via a longer cable.

The internal drive is addressed via the DRSEL0* signal, the external one via DRSEL1* (”drive-Select”).

FURTHER PERIPHERY

DIP switches

Via bus driver V63, the status of the DIP switches T8 can be read in. A closed switch (position ON) causes a ”0” in the corresponding bit. The function of the switch depends on the software.

LED row

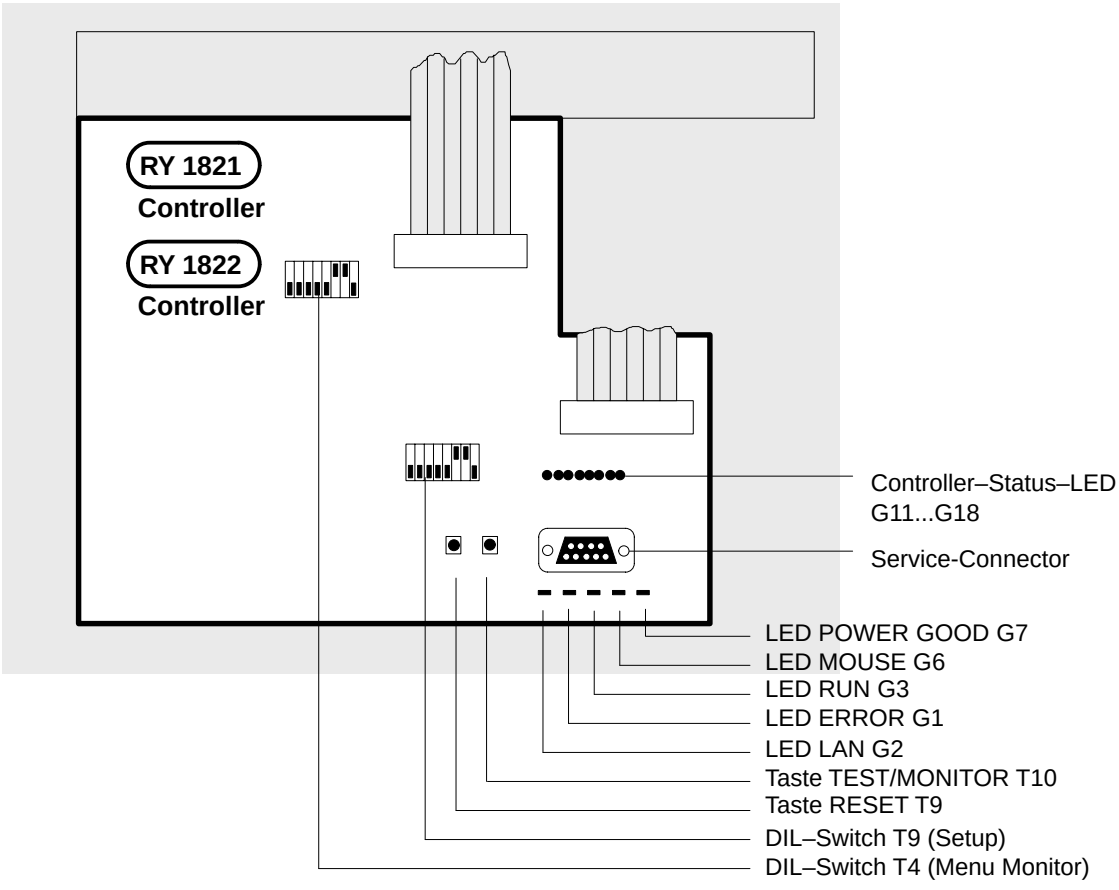
The LED row G11..G18 is controlled by latch V69. A ”1” in the data word switches the corresponding LED off, a ”0” switches it on. The functions of the LEDs depend on the software.

D/A converter

Adjustment of the brightness in the keys is made under software control via a 4-bit DA converter. The DA converter consists of adder V67 with buffer stage V65. At the summing point V67/pin 2, weighted currents are added, the output voltage XVREF (M15) depends on the contents of latch V62. The resistors between latch output and summing point are dimensioned in such a way that the currents approximately correspond to the validity of the associated bit (most significant bit = lowest resistance = highest current, etc.) For this purpose, the voltage can be adjusted in 2^4=16 steps).

Resistor R153/R156 constitutes in conjunction with diode G8 a current limitation in case of short-circuit. As soon as the voltage drop at the resistor exceeds a diode threshold voltage (approx. 0.6 V), transistor V65 is deprived of the base current. The current at XVREF is limited to approx. 120mA.

The voltage deviation of XVREF is shifted by voltage divider R154/R157 towards more positive-going values and amounts to approx. 3.8 V (minimum brightness) up to 1.2 V (maximum brightness).



*Key **RESET** (T9)*

Microcomputer reset.

*Key **MONITOR** (T10)*

If this key is pressed when releasing the reset key, the microcomputer does not enter the normal operating program but the so-called ”monitor”.
This is a minimum system which is operable in the EPROMs. While the microcomputer is in the monitor mode, the red error LED is blinking.

This mode is intended for Philips-internal use only.

*DIL switch **SETUP** (T8)*

The 8-fold switch T8 serves for adjusting the device type. The respective switch position is only inquired after a reset, i.e. a change of the switch position becomes only effective after a reset.
The switch position can also be inquired at the service terminal with the program selection ”V” (see the Service menu, section 4.2).

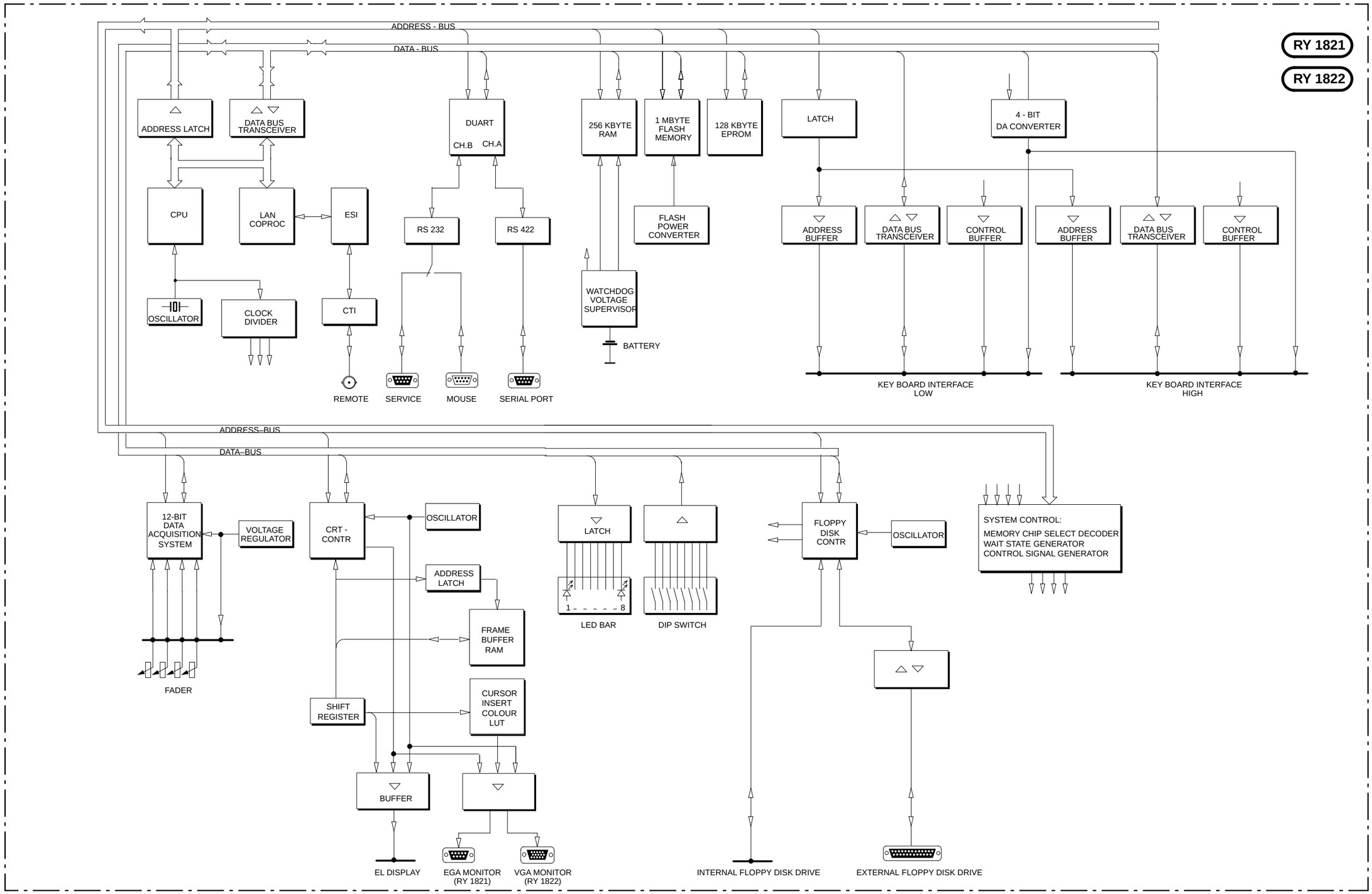
The switches have the following functions:

Switch	**Position** **On = 1** **Off = 0**	**Function**
1	0 1	Service Terminal active Mouse active
2...4	 000 001 010 011 100 101 110 111	Device type of panel: DD30 panel DD10 panel DD20 panel DD5 panel unused unused unused unused
5, 6		unused
7	0	Philips only
8		unused

*LED row **STATUS** (G11 ... G18)*

Status indication of the power-up test. See the chapter ”Diagnosis”, section ”Error Diagnosis”.

Block diagram of control panel controller RY 1821/RY 1822



3.10 INPUT PROCESSOR RY 1900 / RY1901 / RY1902

The input processor includes the following functional groups:

- Automatic cable length equalizer
- Crossing points
- Crossbar selection (extension)
- Control

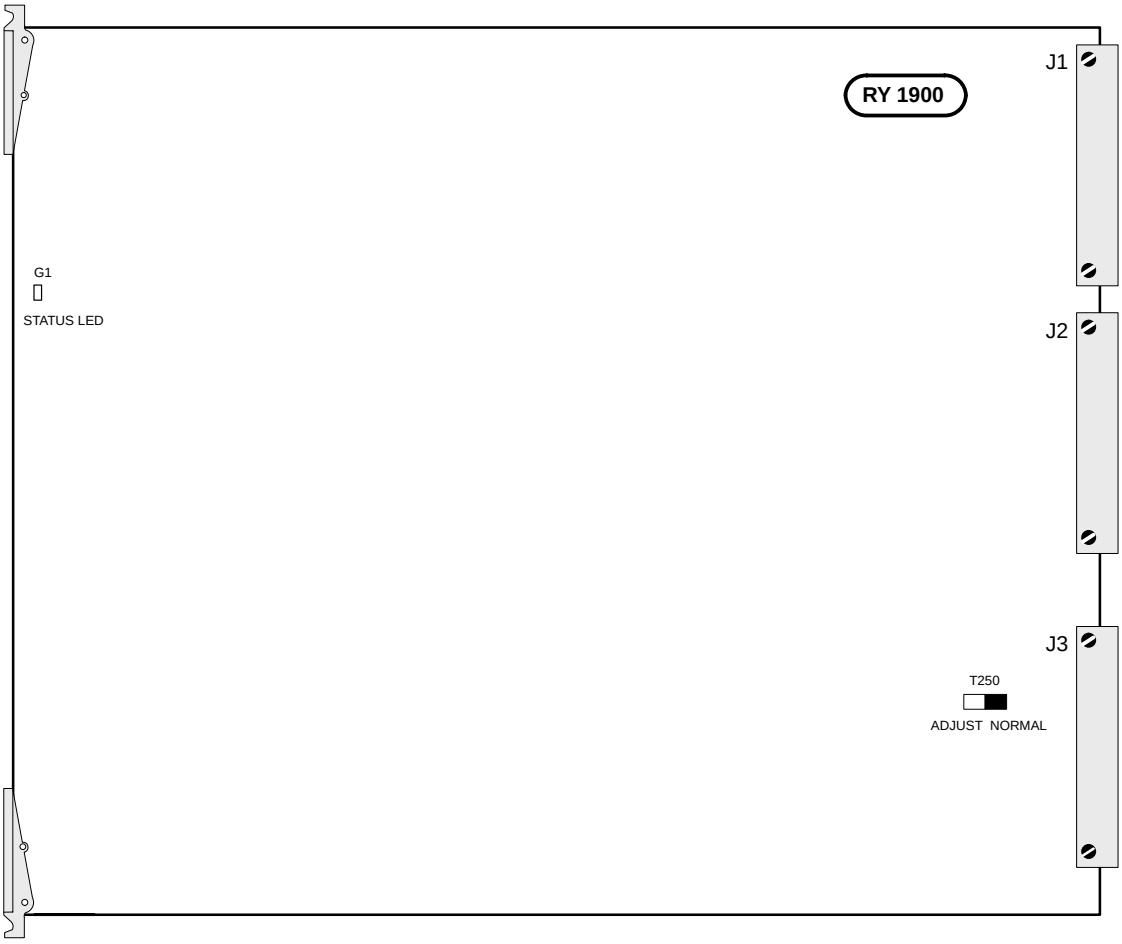
Depending on the application, 3 equipment versions (same mounting plate) are possible:

RY 1900	– completely equipped for RMD 20/30	(16+9 inputs to 48 expandable outputs)
RY 1901	– partly equipped for RMD 10	(16+9 16 outputs)
RY 1902	– partly equipped for RMD 5	(12+9 inputs to 16 outputs)

The description applies to the completely equipped p.c. board RY 1900.

The cable-length-dependent frequency responses of the 16 external serial input signals coming in via coax lines, are automatically equalized in V100, 110 ...250 and converted into push-pull ECL level. Thereafter, they are available at the inputs of the crossing points V1, 3, 5.
The 9 internal serial signals are already arriving with push-pull ECL levels and are directly available at the crossing points V2, 4, 6. Since the crossing points do not have extension inputs, the selection Int/Ext is made by switching over the output lines.
A third switch position extends for DD20/30 to the respective output line of the preceding input processor 1. Switchover is made with ECL AND gates whose outputs are combined triplewise as Wired-OR.
Thus, a crossbar system is available with 32 external and 18 internal inputs at 48 outputs. The input processor supplies serial video signals which are in push-pull on ECL levels.

The crossing points are set with parallel data, successively assigning to each output the required input. After these 3x16 individual preselections, a bankload pulse takes over the complete configuration during the V interval.
The crossbar selection is controlled with serial data which run into a shift register chain and are transferred with the bankload pulse to the outputs. NOR gates decode the switch position for the crossbar extension.
GAL V8 generates from the controller signals the pulses for data trafic in the registers.
Level conversion of the CMOS control to the inputs of the ECL gates is made with resistance dividers whose low ends lie on an auxiliary voltage of approx. –2V generated by V7.
G32 generates for DD20/30 a bias voltage for the non-required extension inputs of input processor 1.



LED ***STATUS*** (G1)

The status LED is a two-colored LED display and is switched off when switching on the unit or resetting the E-box. After having terminated a diagnosis, the lit LED is green, i.e. the p.c. board operates correctly.
When detecting an error on the p.c. board, the status LED is not lit.
If the lit LED is red, slide switch T250 is set to ADJUST and the p.c. board is in the adjust mode

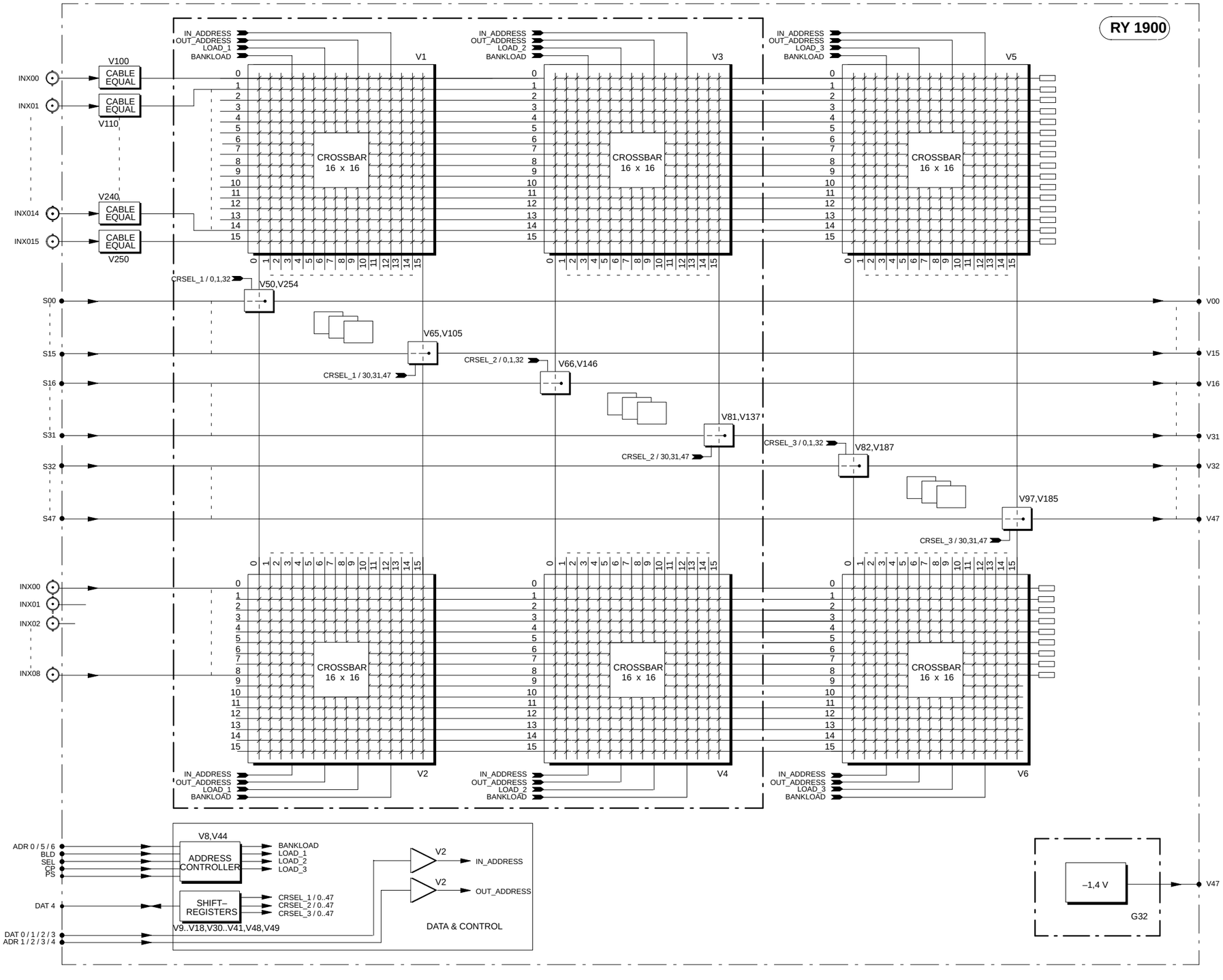
Switch ***ADJUST*** (T250)

In normal operation, the switch has to be set to NORMAL.
Setting the slide switch from NORMAL to ADJUST enables adjustment of the VCOs in the interface components for serial data.
The adjustment is not described in details in the Service Manual, since it can be performed by Philips only!

ATTENTION!

Changing the position of switch T250 will cause functional disturbances of the switcher.

Block diagram of input processor RY 1900/1901/1902



3.11 ME PROCESSOR RY 1903

The ME processor board carries one ME unit each for ”program” and ”preview” with the crossbars required for control. Furthermore, there are circuit parts for processing the input or output video signals as well as the key signals.

The ME processor is provided with six inputs for video signals in the serial data format. These inputs are first parallel-converted and their H positions are timed for compensating delay inequalities (phaser). Two of these input signals (SPEC, DVE) are thereafter directly fed to the ”pre-crossbar” without further data processing. The other four input signals (Bgd-A, Bgd-B, FILL 1, Fill 2) can be provided with a border. The key signals required for this purpose, are fed to the p.c. board in the parallel data format. For filling the borders or key fill insertions, six generators are available for mattes which also represent color wash effects. In order to enable also color wash effects orthogonally to the border edge, two border wash signals can be optionally delegated to two of the four generators for border mattes. The adjustable delay stages in the two key fill inputs serve the shifting of the border positions for the key fill videos.

The succeeding pre-crossbar is supplied on the one hand by input videos described above, and on the other hand by a black and a white generator. The outputs enable selection of the different input sources for the two succeeding ME units. Furthermore, a source for the DVE integration can be selected. The ME processor enables a tranparent switching through of blanking intervals. That means, the information in the blanking interval of a source (normally background A) is inserted in all output videos. Selection of the reference source is made in the pre-crossbar.

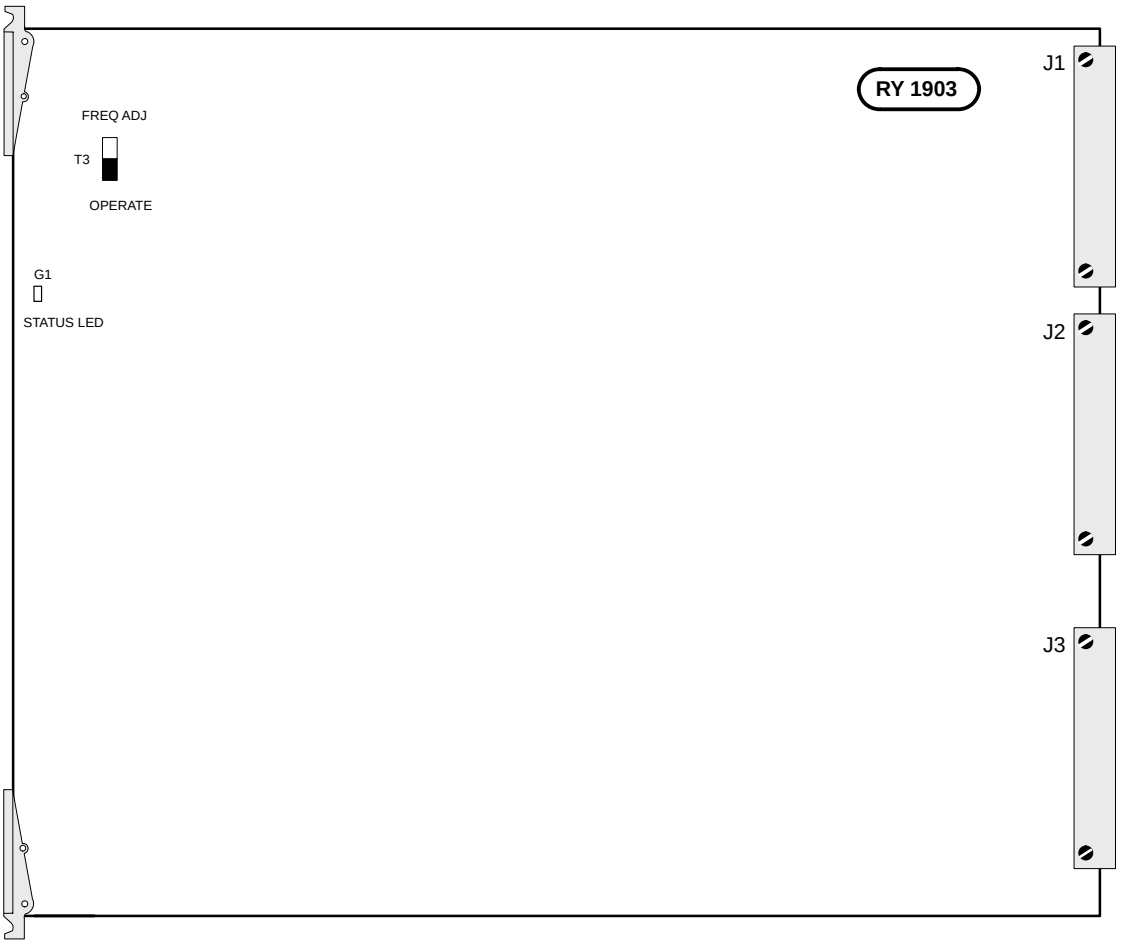
The ME units are composed of four faders, each of them multiplies two video signals with two key signals and adds the products. The faders are connected in cascade and the output of each fader is separately fed out to the ”out-crossbar”. Special applications, require to separate the cascade structure of the fader. For this purpose, controllable changeover switches are available.

The out-crossbar enables selection of the fader outputs or the DVE path for the four p.c. boards. The video signals at the output of the out-crossbar get in the blanking intervals the blanking interval selected on the transparency path.

The four output videos are reconverted into serial data format. They are internally fed to other p.c. boards as well as fed off the board via sockets at the device. The outputs ”Out-1” and ”Out-2” are provided for program or preview video. For ensuring a defined time position, they are fed via phasers. Assignment of the outputs ”Out-3” and ”Out-4” depends on the switcher type and can be learned from the table on the circuit diagram. Output ”Out-1” is also provided with a stage for FADE TO BLACK by means of which the program output can be additionally faded to black. This output is also fed off the board four times for external applications.

All key signals are applied to the board in the parallel data format. For matching the key signal bandwidth to the bandwidth of the chrominance, the part of the key signal designed for chrominance wipe, is filtered. The key signals for the ME units are combined to four groups (A, B, C, D). Each group has a wipe key signal and a control signal. The groups ”B” to ”D” are furthermore provided with a linear mask input. These signals are gated in their group and switched to the key crossbar. The key crossbar assigns these sources to the ME units.

Control of the p.c. board functions is made via the controller interface, the data being transferred serially as well as in parallel.



*LED **STATUS** (G1)*

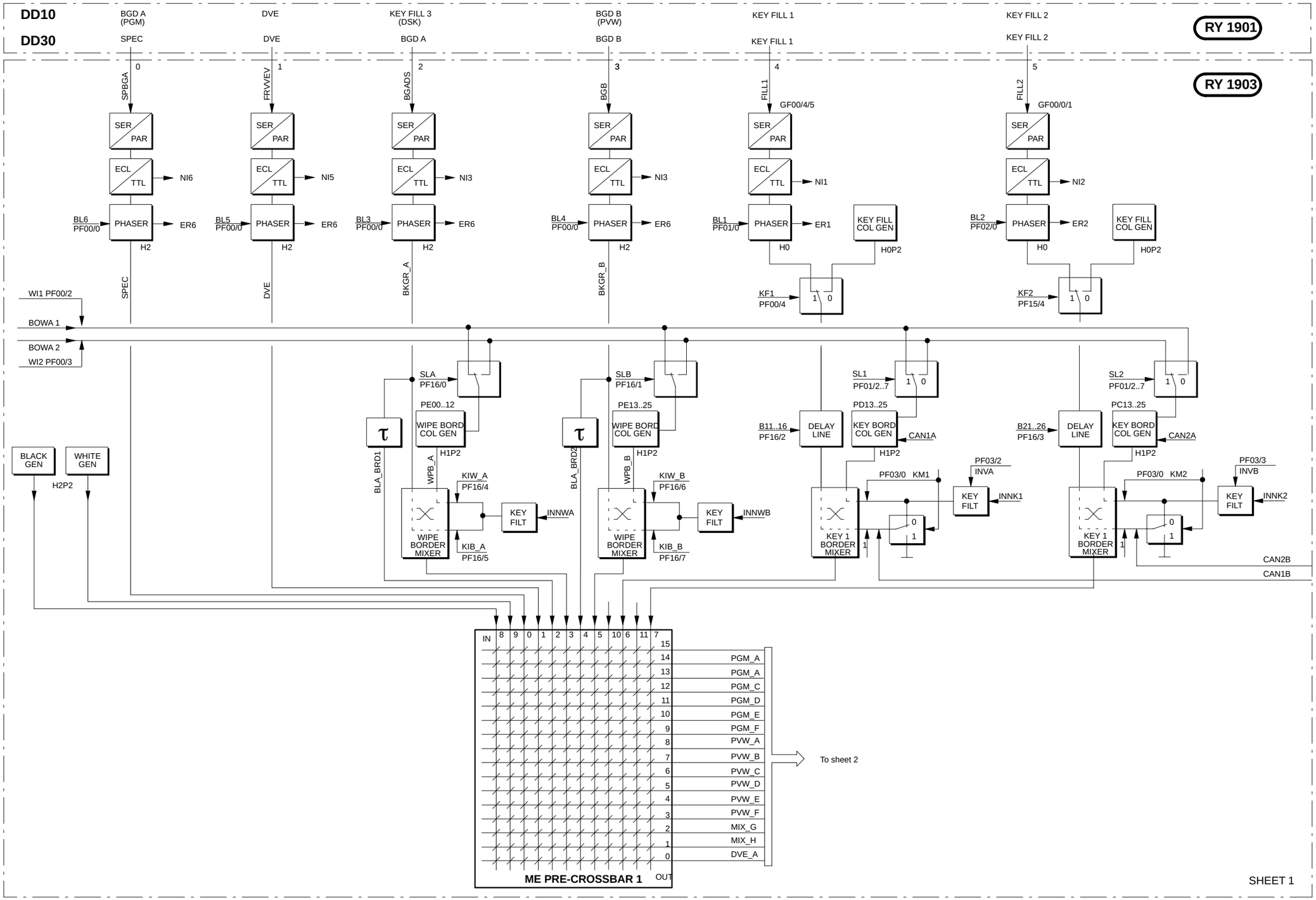
The status LED is a two-colored LED display and is switched off when switching on the unit or resetting the E-box. After having terminated a diagnosis, the lit LED is green, i.e. the p.c. board operates correctly.
When detecting an error on the p.c. board, the status LED is not lit.
If the lit LED is red, slide switch T3 is set to FREQ ADJ and the p.c. board is in the adjust mode.

*Switch **FREQ ADJ** (T3)*

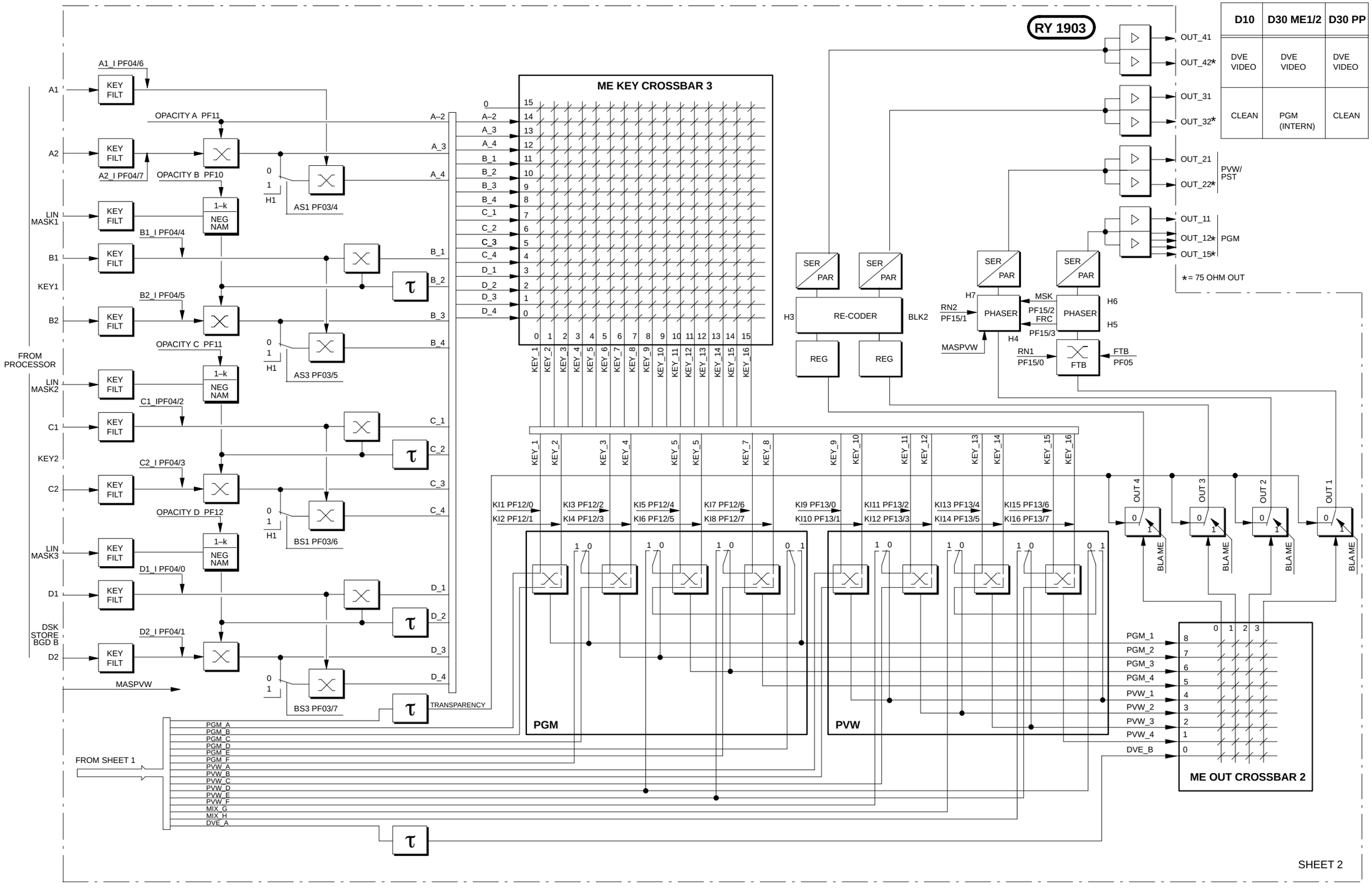
In normal operation, the switch has to be set to OPERATE.
Setting the slide switch from OPERATE to FREQ ADJ enables adjustment of the VCOs in the interface components for serial data.
The adjustment is not described in details in the Service Manual, since it can be performed by Philips only!

ATTENTION!
Changing the positions of switch T3 causes functional disturbances of the switcher.

Block diagram of ME processor RY 1903 (part 1)



Block diagram of ME processor RY 1903 (part 2)



3.12 KEY PROCESSOR RY 1905/1906/1907

Overview

The key processor board of the DD switcher family includes four key paths. The keyers 1 and 2 are the main key paths and can be used as chromakeyer or lumakeyer. They generate either a chromakey signal or a lumakey signal. Keyer 3 is a luminance keyer. In DD5 and DD10, it serves as a dowstream keyer, in DD20 and DD30 as a mask bus. Keyer 4 serves as a DVE keyer.

The first three keyers include a mask NAM for gating key and mask. Key invert, mask invert, force foreground, key off, mask on, as well as blanking of the keys are elementary functions of this stage. It generates a mask preview signal which also represents the processing procedures of the mask store if required. For this purpose, the applied mask signal is gated with the cursor signal of the mask store. For linear key masking, the mask NAM supplies the linear mask to the ME board (chromakey as well as lumakey can be operated in the DD switchers as a add key).

To each mask NAM a mask generator is assigned which generates a rectangular mask. Alternatively, it is possible to select via the key pre-crossbar a key signal, a wipe signal or a signal stored in the mask store and to pass it on as a mask signal via the mask generator to the mask NAM.

The two first mask NAMs are connected with one desat generator each. From a chromakey signal, they generate the CANnx signals which are used on the ME board for improving the chromakeys.

The mask store can be either used as a delay stage for key signals or as a store for mask signals. The paint, rub, clear, shift und freeze functions enable ”painting” own masks. As a ”brush”, either wipe signals or key signals are used. From the input signal, the mask store derives the cursor signal which is fed to the mask NAMs for visualizing the processing procedure of a mask.

The borderliner provides the effects Border and Outline (1H, 2H each), Shadow and Dropshadow (1H, 2H, 3H, 4H each) as well as Far Shadow. For the latter effect, either the mask store is used (DD5, DD10) or a store of the montage store board (DD20, DD30).

In the borderliner, a chromakey enhancement stage is integrated which enables suppression of slight shadows of the chromakey background and to a small extent also noise suppression in the key signal for further improvement of the chromakey. These functions are realized by a clip&gain stage.

A further task of the key pre-crossbar is the assignment of the two borderliners to the first three keyers. This assignment is not fixed, but results from the control concept of the switcher. In order to be able, nevertheless, to border a downstream keyer when using two chromakeyers, a delay stage is provided which also includes an enhancement stage and which is used instead of a borderliner for separating the key signal into two separate channels. The rank possibilities of the key pre-crossbar always enables finding an appropriate assignment of borderliner and delay stage to the keyers.

The key-out crossbar finally serves the ranking of the (bordered) keys 1 to 3, the DVE keys, the FRSTSH signal (from the montage store board, DD20 and DD30 only), the wipe signals and the four wipe voltages Key 1 Mix, Key 2 Mix, Key 3 Mix and BGD Mix. In addition, the key-out crossbar offers – in the same way as the key pre-crossbar – the two signals 0 % and 100 % as virtual inputs.

The INNyx signals as well as the An, Bn, Cn and Dn signals are fed to the ME board. The first ones are used for borderliner effects and standard chromakey, and the latter ones for all mix effects.

Output COLBGST goes to the color background store on the output processor board and serves the modulation of a matte by a key signal.

Output TOVEK is a serial 270 Mbit output. Together with input FRVEK it constitutes an interface for an external effects unit (e.g. DVE).

Analogously, output TOSTSH constitutes together with input FRSTSH an internal interface for the montage store board (DD20 and DD30 only).

Generating the key signals

The keyers find the key signal by addressing a lookup table, the video data of the key source directly addressing the table. The lookup table of the forth keyer consists of a PROM since in this case, only a range matching has to be performed. For the other four keyers, the lookup tables consist of a statical RAM. A multi-DSP stage computes the data of the lookup tables. For this purpose, two signal processors of type TMS320C31 are used, appropriately dividing the computation of key tables. The first DSP also takes over communication with the switcher control and configuration of the lumakey FIR filter, while the second DSP is charged with loading the key tables into the key path and sampling the video data for picture analysis. A parallel unidirectional 32-bit interface and a serial bidirectional interface take over communication and synchronization of the signal processors.

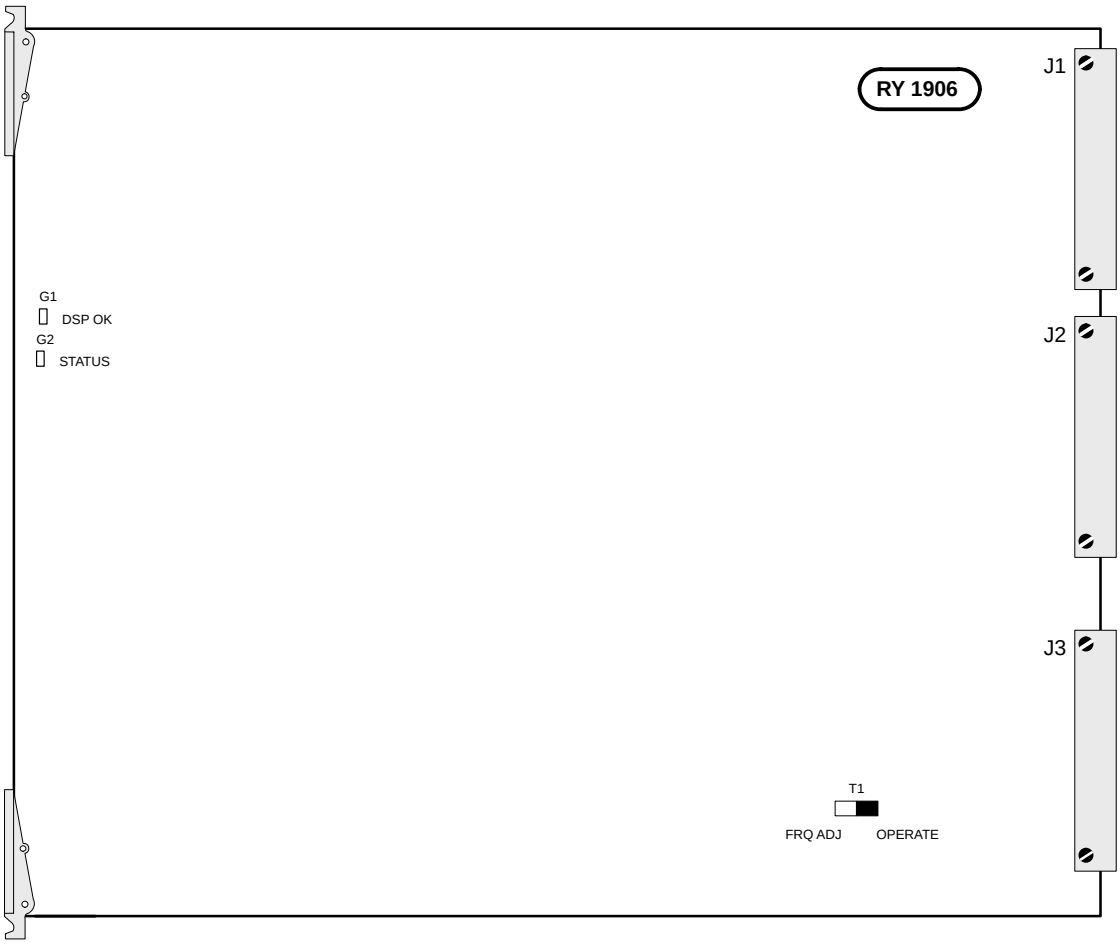
When operating the keyers manually, the switcher control writes the key parameters together with an operation code into the Dual Port RAM and subsequently initiates an interrupt. Thereupon, the DSP stage analyzes the operation code and computates from the parameters the associated key table, writes it into the data RAM and initiates the reload procedure into the key lookup tables. The Daka DMA stage now loads the key table into the selected lookup table. This is implemented in such a way that the reload procedure does not cause picture disturbances. Thus, in principle, an automatic adjustment is also possible online.

When a keyer has to be adjusted automatically, an analysis of the video data of the key source will be required. The DSP stage recognizes the associated operation code and initiates the sampling of the selected key source. The Daka sampling stage loads the video data into the Daka RAM. From there, they are read by the DSP stage which makes an analysis of the picture data for finding the new key parameters. After having found the key parameters, the switcher control takes over these values from the DSP stage for actualizing the switcher status and initiates a ”manual control” of the keyer with the new parameters. Subsequently, the procedure above is started.

Oversampling and filtering

In order to avoid alias effects, oversampling of the key sources will be applied. For chromakey, a four-fold oversampling is made before the lookup table. For lumakey, a two-fold oversampling is made before the lookup table. After the table, a two-fold downsampling is made. After the downsampling, the key signals are available as 4:0:0 signal.

Using the lumakey as a linear key does not influence the frequency response of the key source. For conventional lumakey, however, a band limitation of the key source is made for avoiding alias effects which can be caused by high gain values. For this purpose, 64-tap FIR filters are used, the frequency response of which is defined at the moment in the DSP firmware. In later versions, finding an optimum frequency response by the DSP stage which configurates the filter, would be imaginable.



*LED **DSP OK** (G1)*

The lit DSP-OK LED is green after successful run of the DSP selftest (digital signal processing).

*LED **STATUS** (G2)*

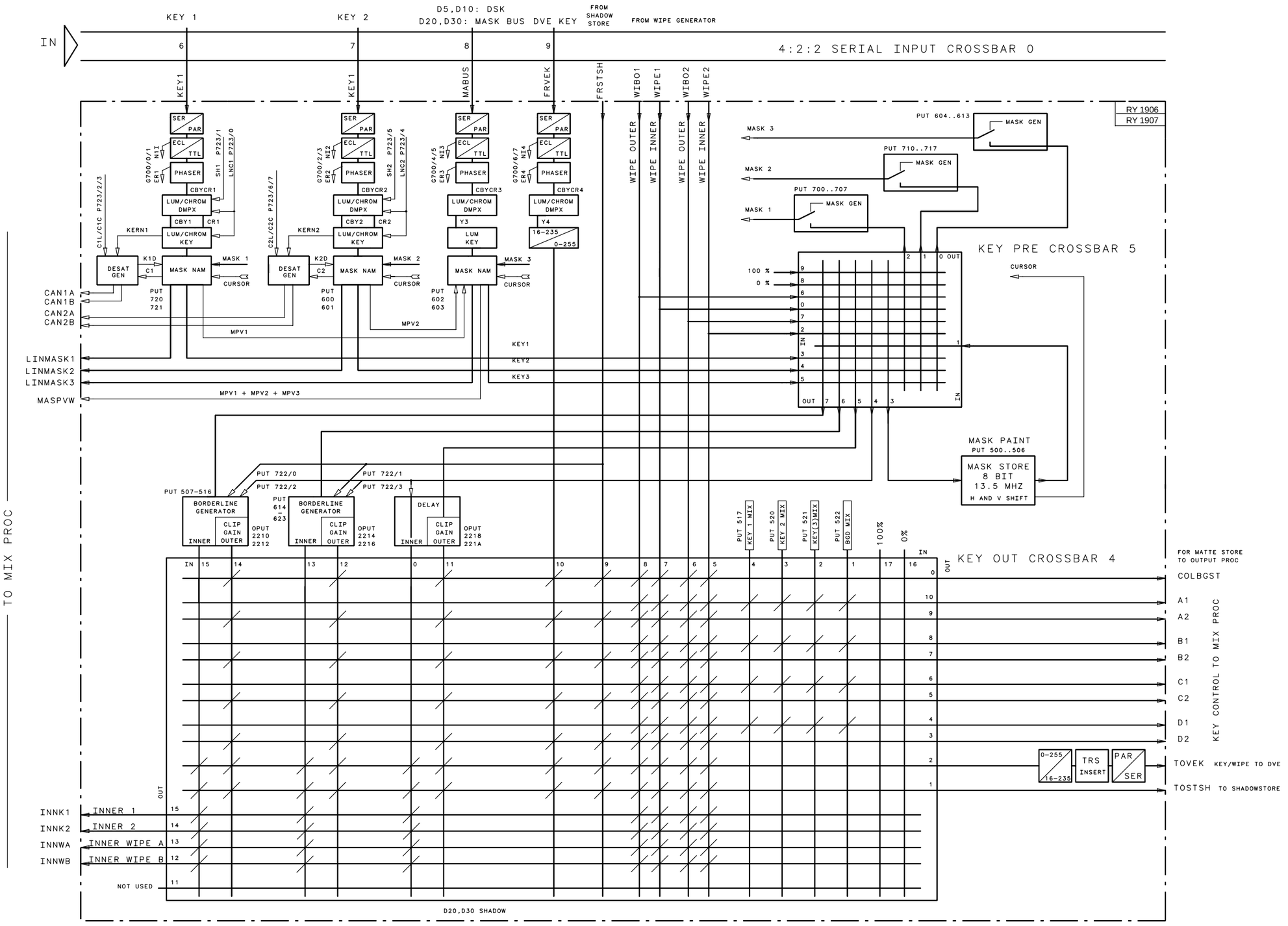
The status LED is a two-colored LED display and is switched off when switching on the unit or resetting the E-box. After having terminated a diagnosis, the lit LED is green, i.e. the p.c. board operates correctly.
When detecting an error on the p.c. board, the status LED is not lit.
If the lit LED is red, slide switch T1 is set to FREQ ADJ and the p.c. board is in the adjust mode.

*Switch **FREQ ADJ** (T1)*

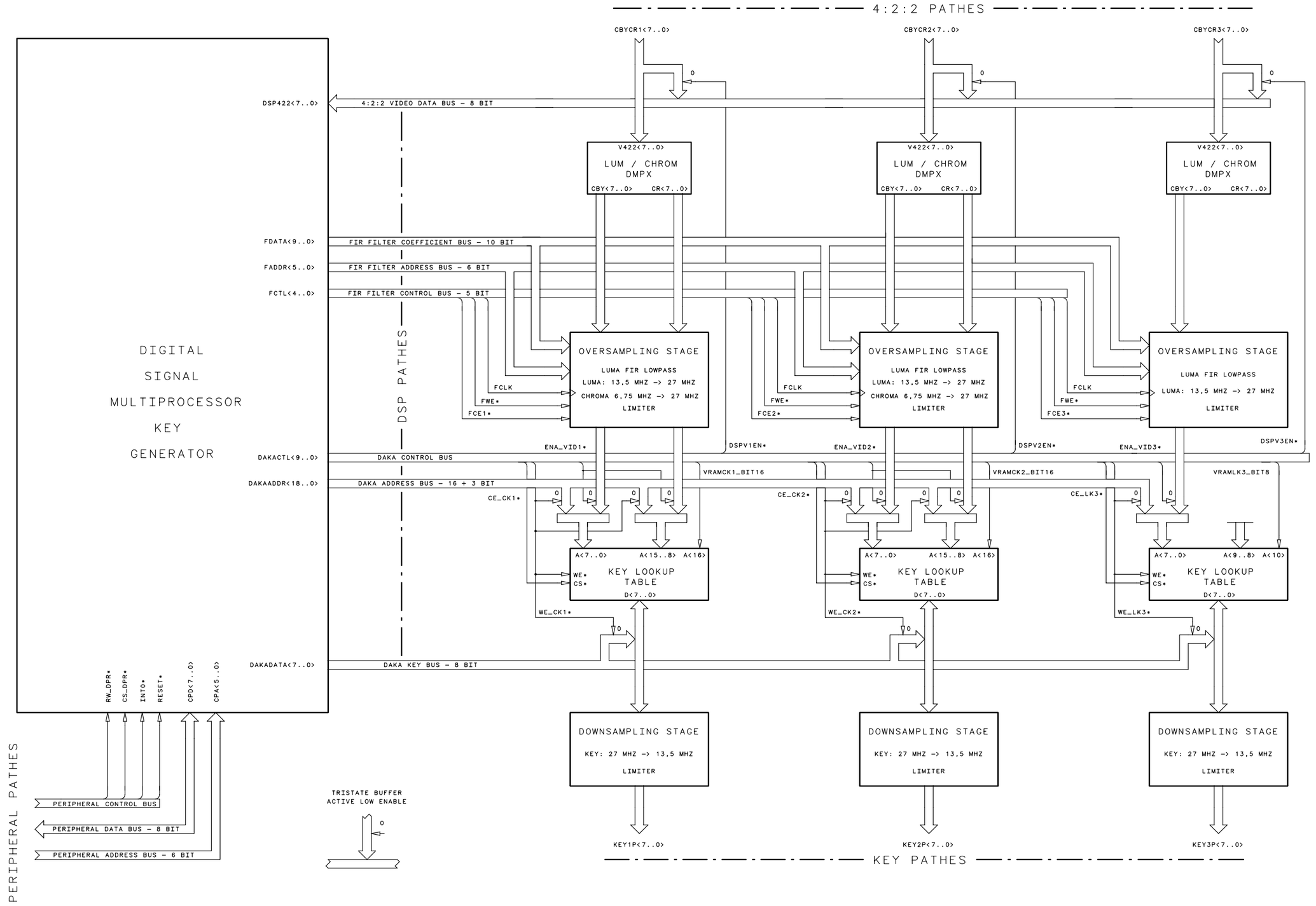
In normal operation, the switch has to be set to OPERATE.
Setting the slide switch from OPERATE to FREQ ADJ enables adjustment of the VCOs in the interface components for serial data.
The adjustment is not described in details in the Service Manual, since it can be performed by Philips only!

ATTENTION!
Changing the positions of switch T1 causes functional disturbances of the switcher.

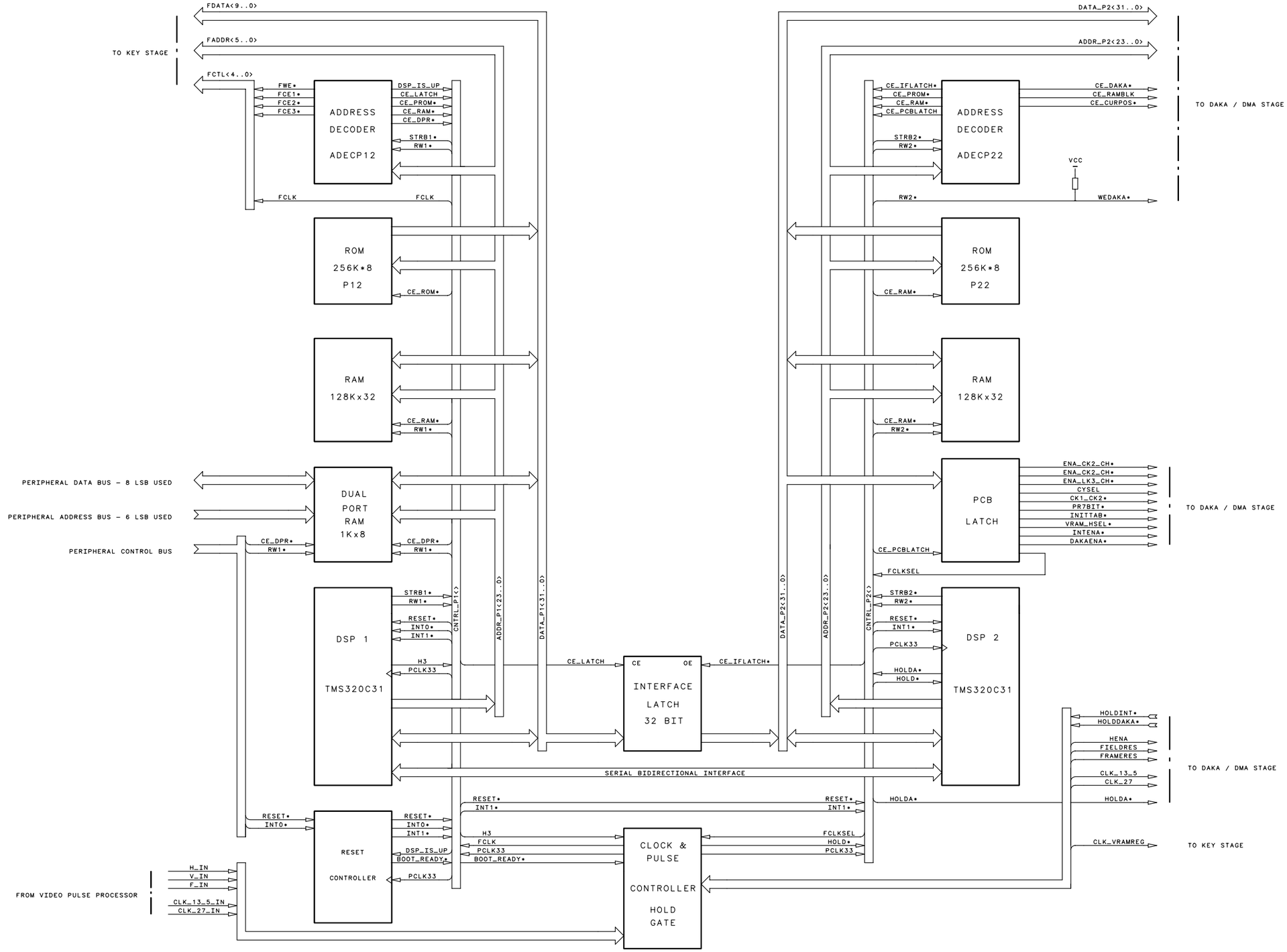
Block diagram of key processor RY 1906/1907 (part 1 of 4)



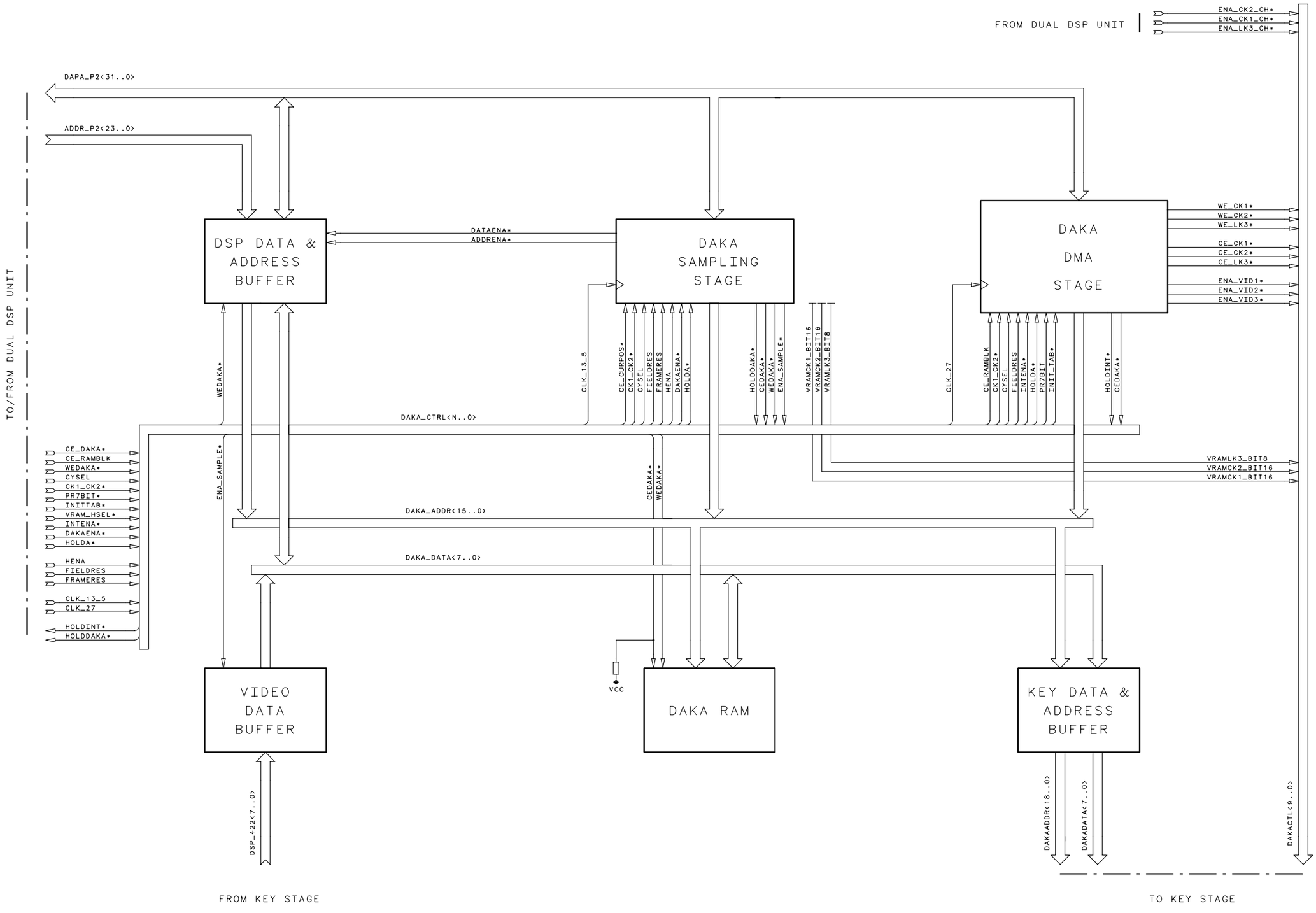
Block diagram of key processor RY 1906/1907 (part 2 of 4)



Block diagram of key processor RY 1906/1907 (part 3 of 4)



Block diagram of key processor RY 1906/1907 (part 4 of 4)



3.13 WIPE PROCESSOR RY 1908 / RY1909 / RY1910

The wipe processor generates the signals WIPE (INNER) und WIPE_BORDER (OUTER) required for wipe pattern mix.

Depending on the equipment, the WIPE PROCESSOR board carries two independent wipe generators (WIPE_GEN 1 lower p.c.b. part and WIPE_GEN 2 upper p.c.b. part).

Depending on the type of equipment, the following p.c. boards (same mounting plate) have the following designations:

RY 1908 – fully equipped option for RMD 10/20/30 (two wipe generators)

RY 1909 – partly equipped for RMD 10/20/30 version (one wipe generator)

RY 1910 – partly eqipped for RMD 5 (one wipe generator; matrix and combined wipes are not possible).

The figure below shows in simplified form the principle of pattern signal generation. From the H/V sawtooth signal passing through a preprocessor, an amplitude distribution Z = function (H,V) is generated which, depending on the pattern type (rectangle, circle etc.) has a defined form. Clipping a signal portion with the ”Clip and Gain” stage generates the proper wipe signal WIPE or WIPE_BORDER.

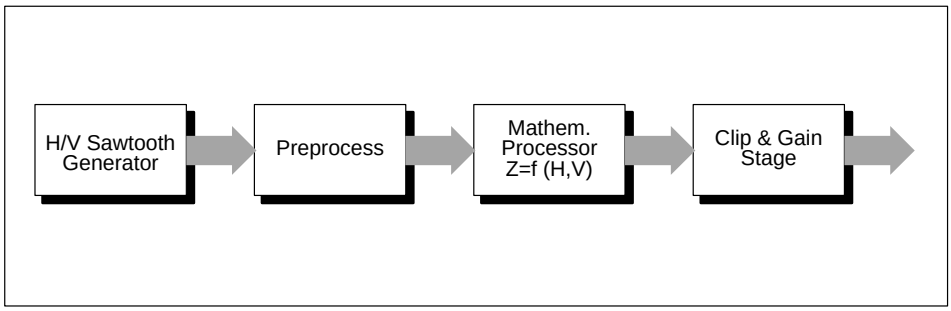


Fig. 1: Principle of wipe pattern mix

The preprocessor lies in the basic pattern generation channel (no matrix) and has the following tasks:

- Pattern multiplication in H and V direction (MULTI).
- Mirroring (SYM).
- Edge modulation in H and V direction (MOD_GEN) with different signal shapes (WFM).
- Rotation of the pattern, change of aspect ratio (ROTATION / RATIO).
- Change of aspect ratio without changing the softness (H/V_STRETCH)
- Fixed rotation of 45° for some special patterns.

After being processed in the preprocessor, the composite H/V signal is fed to the mathem. processors (being different in dependence on the pattern type) for generating the amplitude distribution. For this purpose, circuits are provided for rectangular patterns (RECT.COMB), as well as circles and fans (POLAR).

Generation of the matrix pattern is made with a separate H/V address generator (MATRIX), an influencing by the above-mentioned preprocessor is not possible.

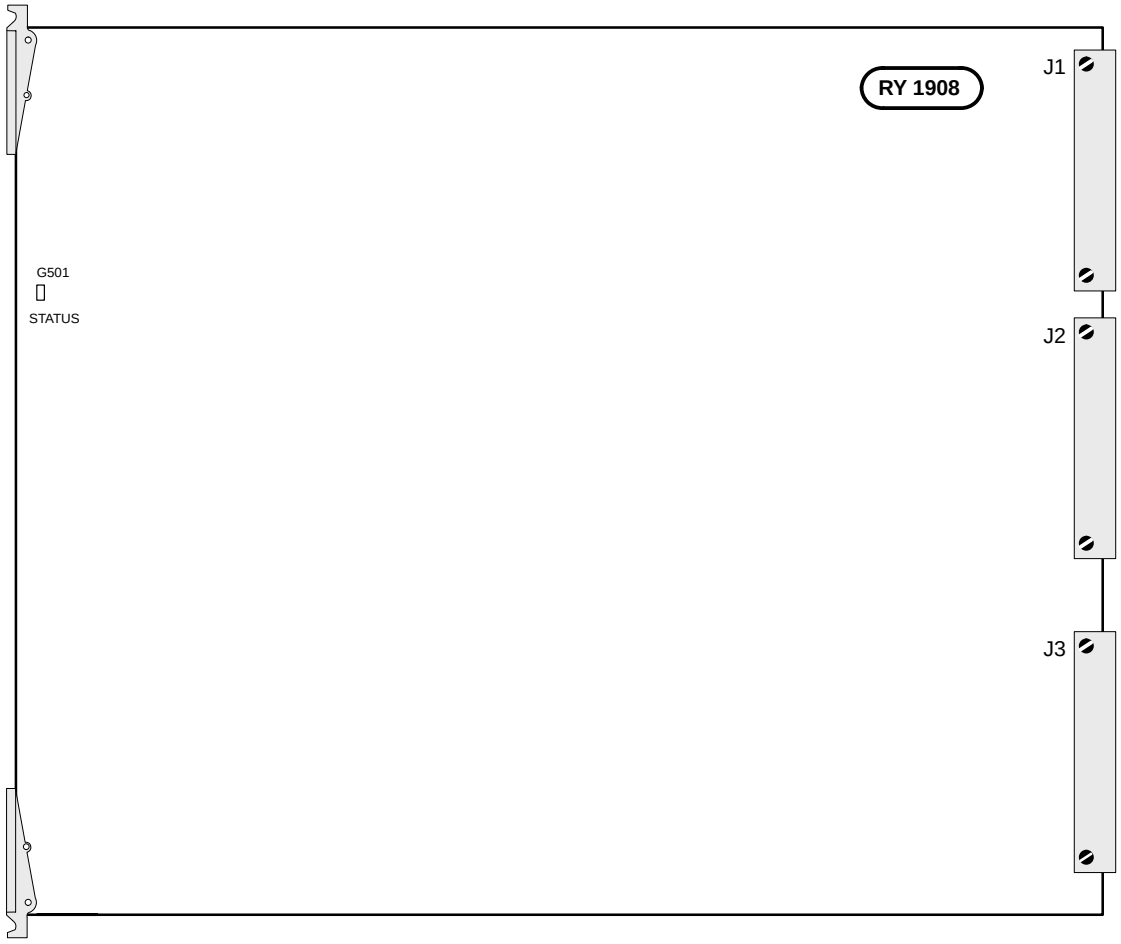
The pattern types obtained in this way, are fed to a crossbar and can be optionally switched to three channels. Due to different processing times of the pattern types, a switched delay matching is performed in the output channels A,B,C.

As a special feature, it is possible to mix two basic patterns (CHANN B,C+PATTERN MIX) after the crossbar, providing in channel C the possibility of a special pattern multiplication in radial or circular direction depending on the pattern type (MODULO). The same modification can be also applied to the mixed pattern.

After being processed in this way, a direct channel A as well as the mix channel are fed to the clip and gain stages (CLIP,SOFT) for generating the proper transition signals. The use of two channels also enables non-additive mixing of two pattern types (NAM). By appropriate gating of wipe and border signal, the transparency can be optionally adjusted in the border area (OPACITY). After subsequent edge shaping and dynamic rounding, the signals WIPE and WIPE BORDER (WIBO) are available on other p.c. boards for control of the pattern mixing stages.

Furthermore, one channel of the clip and gain stage can be used for border modulation (BOWA).

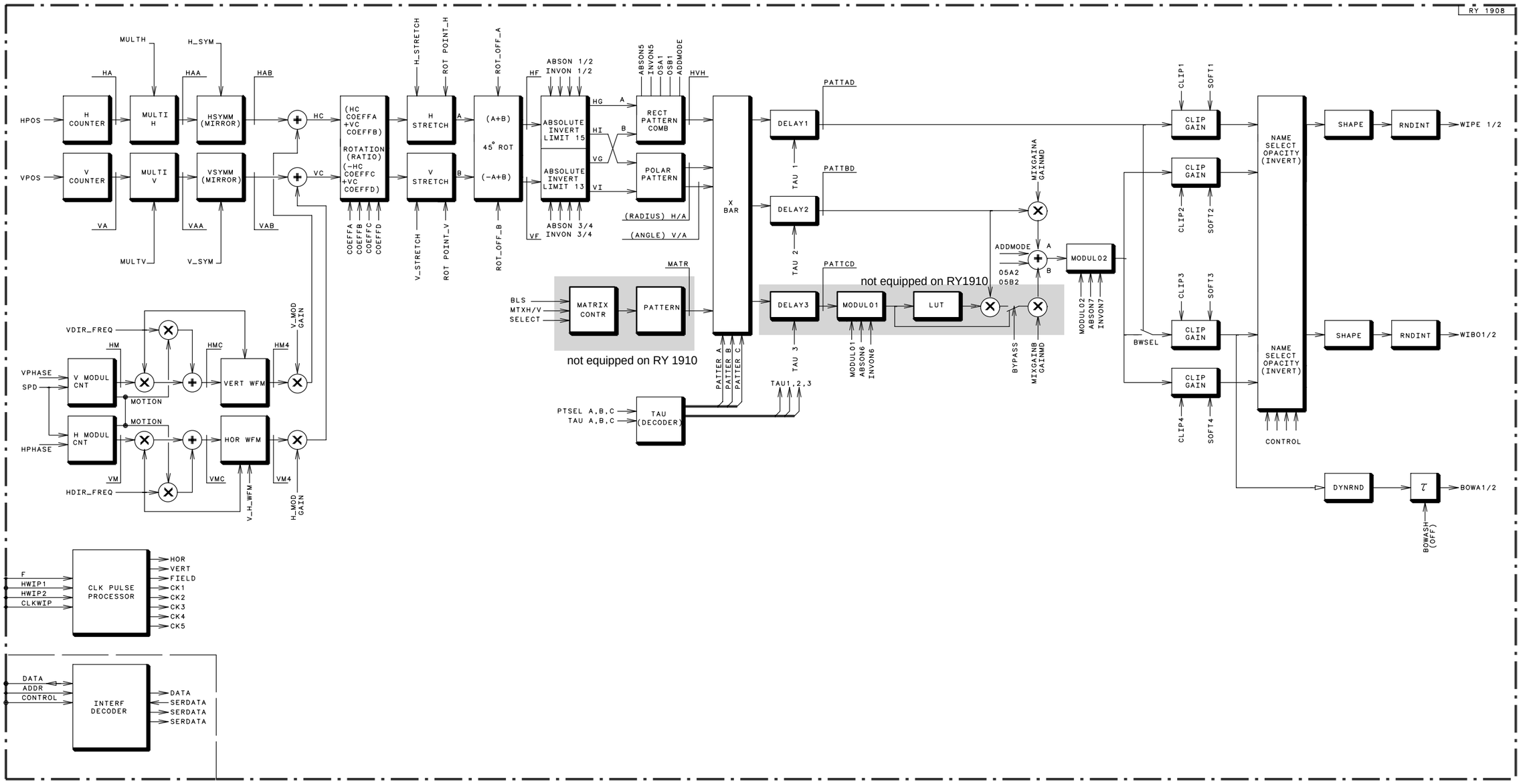
In order to enable a great number of pattern variations, all positions allowing a pattern modification, can be influenced by control software (CONTR INTERF).



*LED **STATUS** (G501)*

The status LED is switched off when switching on the unit or resetting the E-box. After having terminated a diagnosis, the lit LED is green, i.e. the p.c. board operates correctly.
When detecting an error on the p.c. board, the status LED is not lit.

Block diagram of wipe processor RY 1908/1909/1910



3.14 GENLOCK / OUTPUT PROCESSOR RY1911 / RY1912 / RY1914

The genlock/output processor includes the following functional groups:

- Genlock
- AUX output stages with autophasing
- Background mattes
- Video store
- Diagnosis

Depending on the application, 3 equipment versions (same mounting plate) are possible:

RY 1911 – fully equipped option for RMD 20/30 (AUX-Ext.)

RY 1912 – partly equipped for RMD 10/20/30

RY 1914 – partly equipped for RMD 5

The description applies to the fully equipped p.c. board RY 1911.

The genlock stage comprises the analog input amplifier with sync separation, the 27MHz oscillator with PPL stage and the H/V pulse processing. With switch T3, pulse processing and consequently the complete switcher is switched over to 5257625 lines.

Depending on the type, the p.c. board carries 3 to 11 AUX output stages. These stages get their serial input signals from the main crossbar. The serial signals are converted by deserializers into parallel signals and the timing of the input signals is fixed via an autophasing stage to a constant output timing. Succeeding serializers convert the parallel signals into serial signals. They are fed via buffer stages, to the AUX output stages.

The p.c. board carries 2 background matte generators. They consists each of a matte ASIC and a serializer with buffer. The mattes supply their signals to the main crossbar. The matte ASICs have two separately adjustable colors and a fader with integrated color wash generator. Matte 1 additionally has a frame store before its external color wash signal input. This frame store enables storing key and wipe signals.

For storing a colored picture, a frame store is provided which is able to store a frame. This signal is supplied to the main crossbar.

For the diagnostics of the switcher, a circuit is provided which can compare two signals. This circuit is supplied by the frame store bus and AUX 1 bus. The pulses generated on the p.c. board, are also monitored by the diagnostic facility.

LED ***STATUS*** (G1)

The status LED is a two-colored LED display and is switched off when switching on the unit or resetting the E-box. After having terminated a diagnosis, the lit LED is green, i.e. the p.c. board operates correctly.
When detecting an error on the p.c. board, the status LED is not lit.
If the lit LED is red, slide switch T1 is set to ON and the p.c. board is in the adjust mode.

Switch ***FREQ ADJ*** (T1)

In normal operation, the switch has to be set to OFF.
Setting the slide switch from OFF to ON enables adjustment of the VCOs in the interface components for serial data.
The adjustment is not described in details in the Service Manual, since it can be performed by Philips only!

ATTENTION!
Changing the positions of switch T1 causes functional disturbances of the switcher.

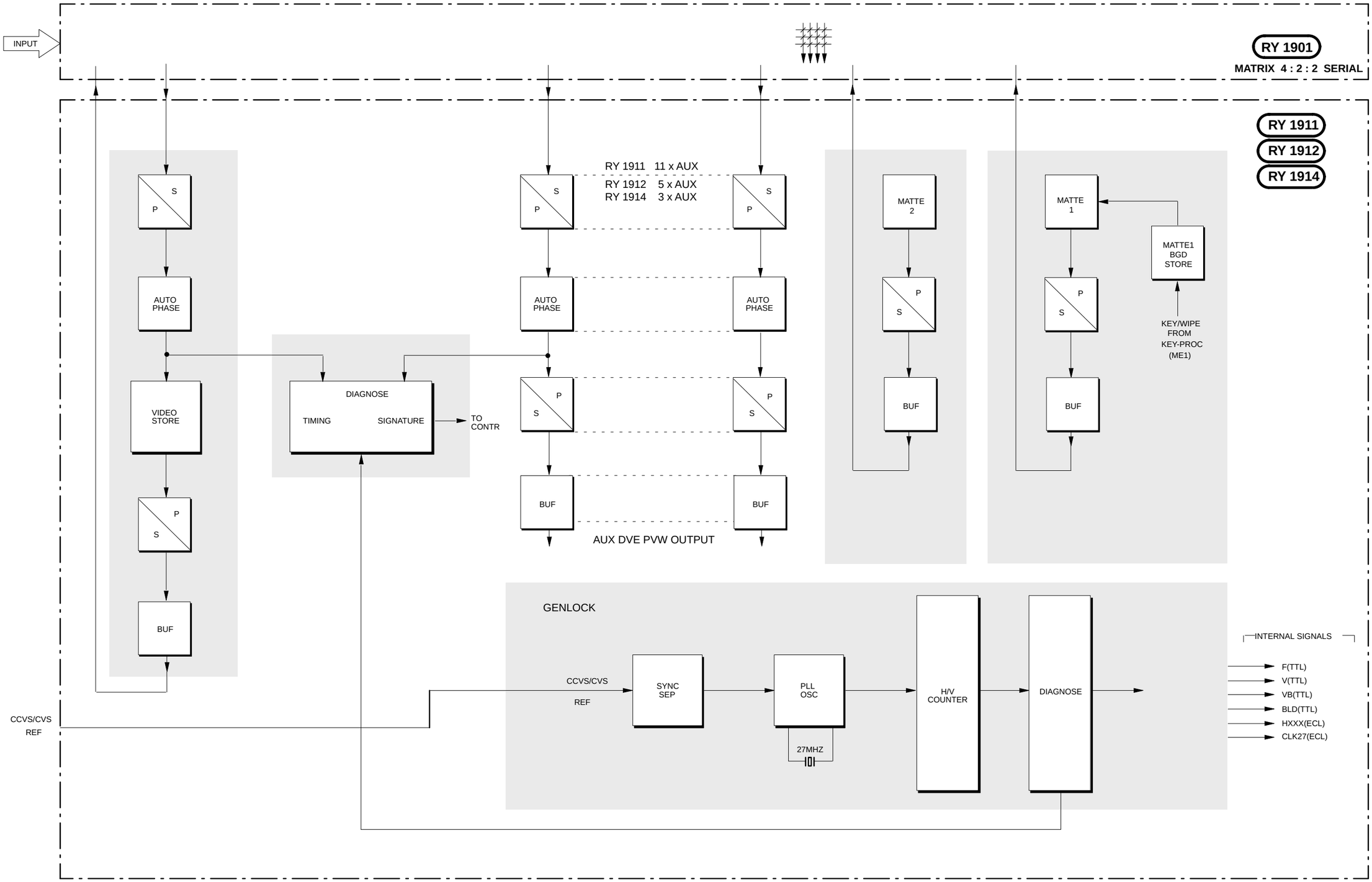
LED ***NO EXT. REF*** (G30)

The LED indicates whether an external reference signal is applied to the switcher.
If the lit LED is yellow: no ext. reference signal is applied to the switcher
the LED is not lit: ext. signal is applied to the switcher

Switch ***NORM*** (T3)

Standard selector switch for operation with 525 lines and 625 lines.
The switch must be only switched over with the power disconnected. Furthermore, a reference signal of the corresponding standard should be applied before switching on again.

Block diagram of genlock/output processor RY 1911/1912/1914



3.15 MONTAGE STORE RY1913 (Option)

The mounting processor board is provided with two full store channels with one pixel manipulator and one background matte processor each. This arrangement enables shifting video and key signals as well as performing pixel-related changes. The stores consist of two frame stores each, connected in series; thus, also asynchronous video sources can be synchronized. In addition, three real key stores are available by means of which shadows for key video can be freely positioned.

The generation of the pulses required for the control takes place in the pulse controller unit which consists of many programmable modules. The task of the first frame store is sychronizing asynchronous video signals. For this purpose, the timing reference information is derived from the input signal and processed. The second frame store is mainly responsible for shifting the stored picture. In the shift mode, the first frame store performs a fixed delay of one V. The second store delays a further V in the center position so that there will be a total delay of 2V cycles. At all positions shifted from the center, the second store performs a delay within zero V and two V. In the latch mode, both frame stores perform a fixed delay of two V so that there will be a total delay of 4V cycles.

The two store channels are set up identically. The input signals are fed in serial-digital form to the p.c. board. After parallel conversion and level conversion to TTL level, the video signal data is splitted into its luminance and chrominance components. A store channel is composed of two frame stores. Each frame store is splitted into two field stores (Field A and Field B). The second frame store is placed after the first store. A switch at the output of the two frame stores enables to select the store the output signal is taken from. For the latch mode, this switchover can also be carried out dynamically. That is, after an adjusted number of pixels or lines, switchover is made between the two stores. The separate storage of Field A and Field B also enables to store different fields in the field stores and to read out with FieldA/B-Output as a frame.

The stores for the chrominance path are set up identically with regard to the stores of the luminance path and will not be described here in detail.

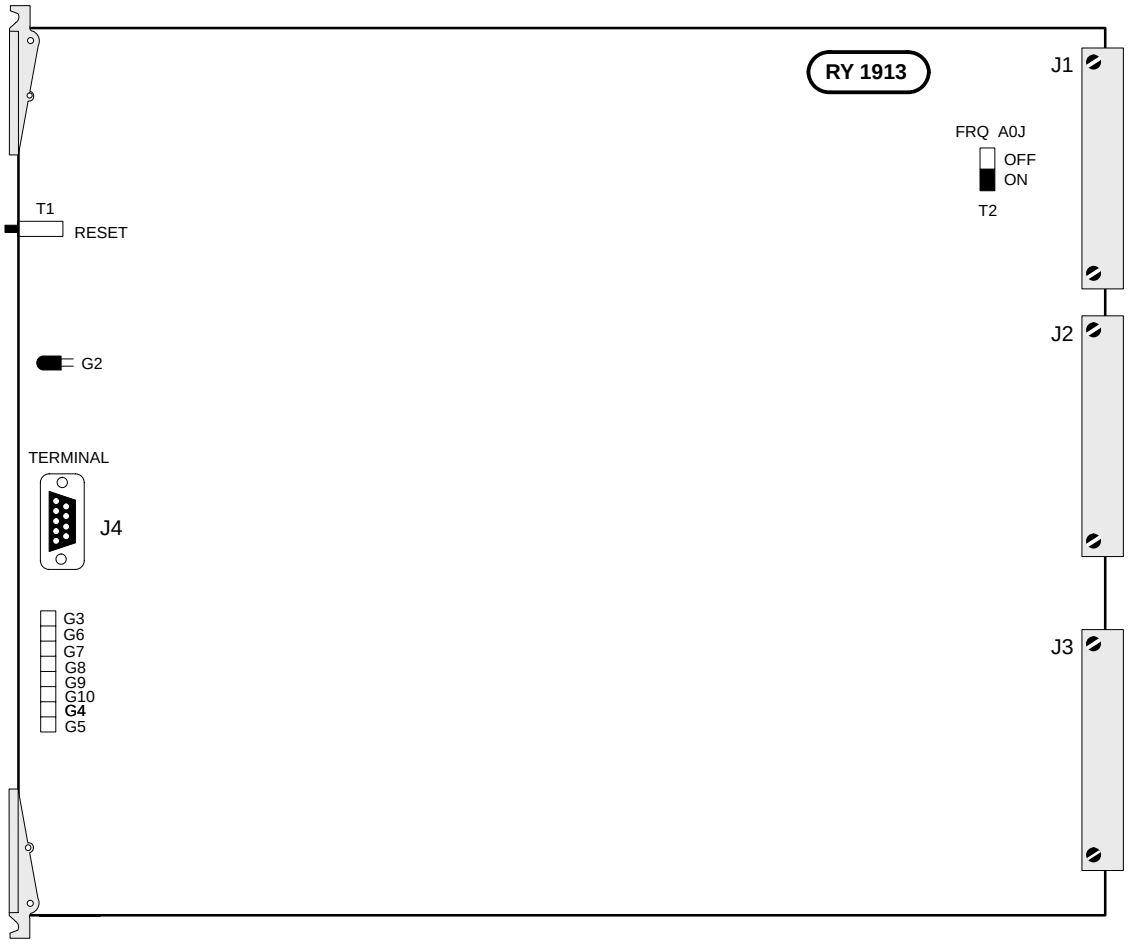
After being stored, the signals pass through the pixel manipulator. The pixel manipulator also operates separately with luminance and chrominance components. In the event that no manipulations are made, there will be one bypass path each which allows that the video passes unchanged. If there will be manipulations , the video signal components run through individual tables in which the desired manipulations are filed. The calculation of the tables and the control of reloading will be carried out with a signal processor which receives from the mixer control the parameter changes which then are reflected in changed characteristic curves. The luminance component of the video signal is directly influenced, whereas the chrominance components being available in cartesian coordinates require a conversion into polar coordinates in order that the manipulation can take place via color angle and saturation.

At the output of the pixel manipulator, the luminance and chrominance components are combined to build again a signal current. If the video signal was shifted in the stores, a new matte will now still be inserted in the shifted picture areas as a new background. This matte is delivered from an ASIC and is able to do the customary modifications for mattes in the mixer. After that, a re-convertion is made into the serial-digital format, as then will leave the board.

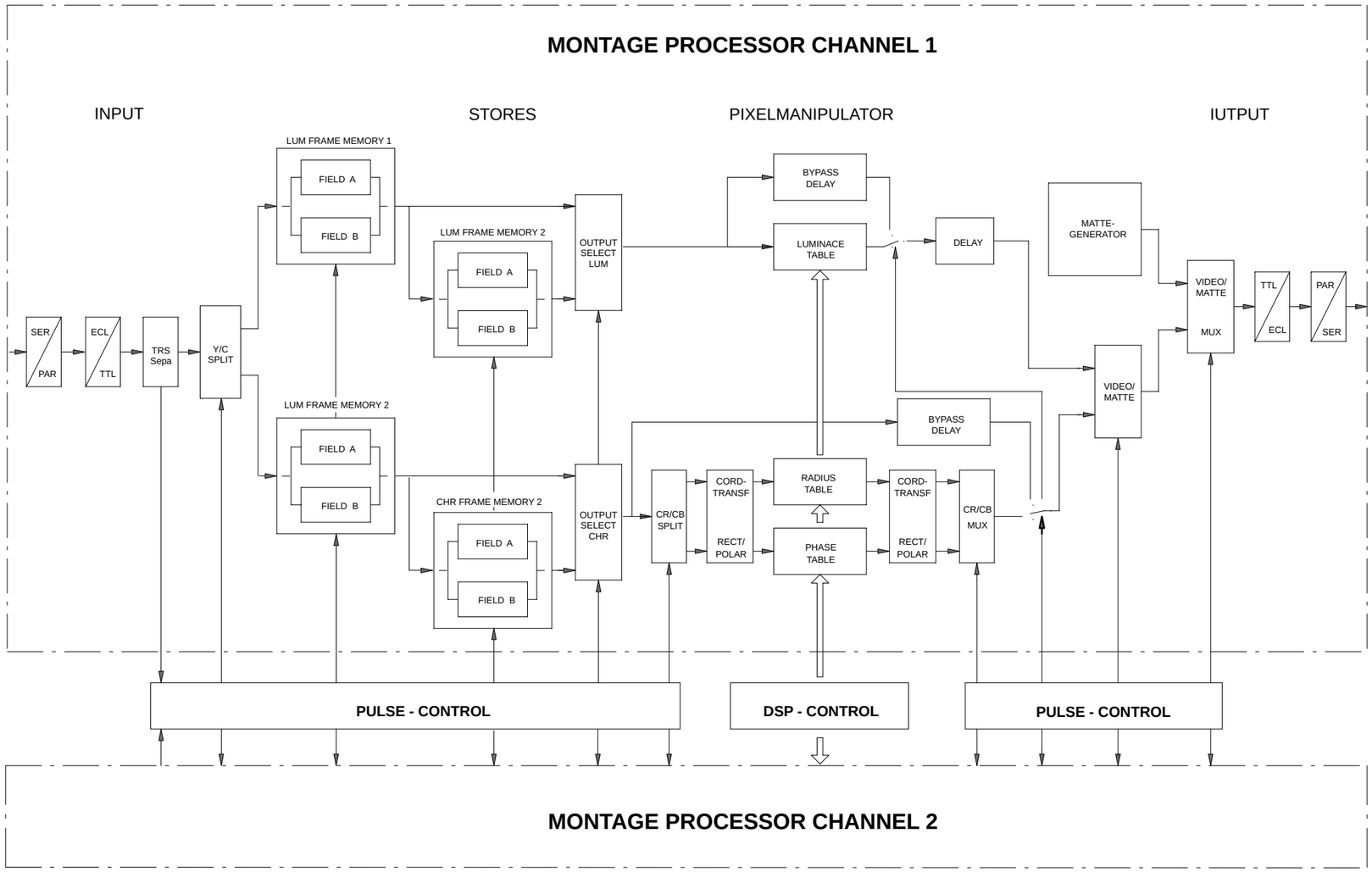
The same board also carries three key stores enabling shadows which can be freely positioned. Each key store is fixed-assigned to an ME and can be used there for Key1 or Key2. The key signals are fed to and off the board in parallel format.

They are stored in frame stores, separately according to Field A and Field B. A pulse control unit controls reading out and shifting the shadow.

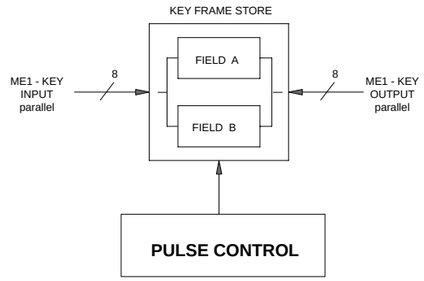
LED STATUS (G2)	The status LED is a bi-colored LED display and (see other descriptions)
Switch FREQ ADJ (T2)	(see other descriptions) ATTENTION: Inscription of the white print on the board is interchanged.
Taste RESET (T1)	DSP-Reset (digital signal processor)
LED line STATUS (G3 ... G10)	Status display of the DSP:
G 3 low ON	Reload V interrupt for tables
G 6 OFF	MSG from controller
G 7 ON	Processing runs
G 8 OFF	not used
G 9 OFF	Error message: V interrupt is missing
G 10 OFF	Error message: processing does not run
G 4 OFF	not used
G 5 OFF	not used
TERMINAL connector socket (J4).	At this interface, a terminal for the DSP can be connected

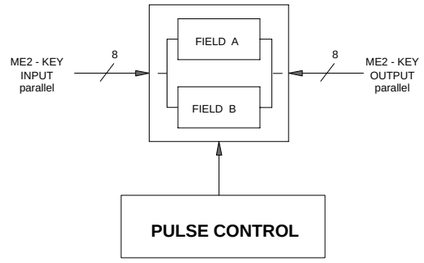


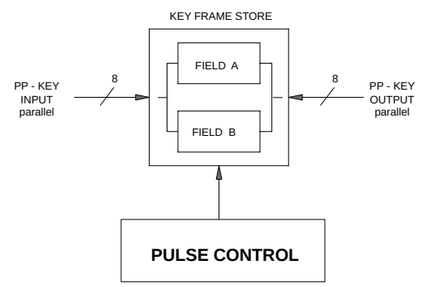
Block diagram of store RY 1913



SHADOW STORES







3.16 CONTROLLER RY1917 / RY 1601

GENERAL

The electronics boxes of the switcher types DD 5/10/20/30 are each provided with controller board RY1601 or RY1917.
P.c. board RY1917 is a partly equipped version of RY1601. P.c. board RY1601 is able to control two plug-in frames (interface to video electronics). Since the video electronics can be housed in one single plug-in frame, for RY 1917, the bus interface for the second frame was renounced.

P.c. board RY1917 (RY1601) carries two microcomputers. The first one (”A” or ”Master”) is charged with the superior system control, the second one (”B” or ”Slave”) mainly operates serial interfaces. Both microcomputers are designed similarly, they only differ in type and complexity of the periphery.

The following text gives a detailed description of identical circuit parts for the master only, the corresponding description for the slave points to possible differences.

TWO-PROCESSOR SYSTEM

The microcomputers base on the 16-bit CPU 80C186. The 80C186 CPU is an ”embedded-controller”, i.e. beside the real microprocessor (16-bit), several peripheral functions is integrated on the chip.

These functions mainly are:

– Interrupt controller
– DMA controller
– Timer/counter
– Chip-select unit
– Waitstate generator

Bus system nomenklature

The microcomputers consist of local resources (memories, periphery) which can be exclusively accessed by the respective CPU. In addition, there are global resources which can be simultaneously accessed by both CPUs.

The CPU transmits addresses and data in the time multiplex way. The addresses are transmitted to latches (demultiplexed) and buffered. Data are (bidirecionally) buffered via bus transceivers. The microcomputers include two sets each of address latches and bus transceivers. One set each feeds the local recources. The designations of the corresponding buses contain a ”RES” (resident). The other set constitutes the system bus via which the global resources are accessed. The designations of the associated buses contain a ”SYS”.

The designations of all local buses being assigned to the master, contain a ”1”, those being assigned to the slave, a ”2”. Thus, the following nomenclature is obtained:

MUX1AD: multiplexed address/data bus from the master

MUX2AD: same from the slave

RES1ADR: local address bus from the master

RES2ADR: same from the slave

RES1DAT: local data bus from the master

RES2DAT: same from the slave

SYSADR: system address bus (global)

SYSDAT: system data bus (global)

In addition, there is a number of control signals being combined in several buses with the designation ”CTRL” (control). The designation contains furthermore at the first place a ”1” or ”2” for master or slave, as well as at the last place a consecutive number.

SUPERIOR SYSTEM CONTROL

Clock generation

The CPUs are supplied by oscillator T6 via buffer V15 with a 40-MHz clock, thus obtaining a system clock of 20 MHz (internal division by 2). Via flipflop V14 or counter V16, further clocks for other system components are obtained by division.

Service interfaces

Both microcomputers (master and slave) include a service interface with RS23 interface. The interface of the master can be accessed on the connector panel at the SERVICE socket, as well as on p.c. board RY 1601/1917 at socket J6. The service interface of the slave can be only accessed on p.c. board RY 1601/1917 at socket J7.

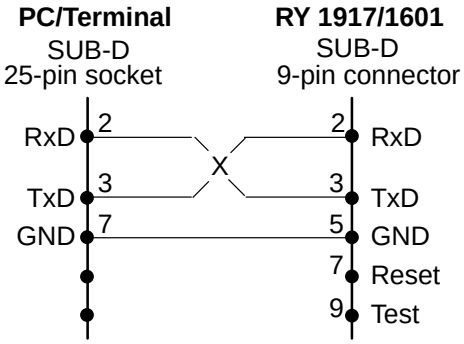
Use the master socket for loading the software for master and slave!

Attention:

The pins 7 and 9 of the connection cable must not be connected with the PC/terminal. In dependence on the logic level, this might lead to a permanent reset or to the start of the monitor program.

The two terminal sockets on RY 1917 (RY 1601) or on the connector panel must not be connected with PCs and/or terminals at the same time.

Connection cables:



Power-up, watchdog and reset

Both microcomputers include a monitoring circuit (V3/V5) which generates a defined reset during increase of the 5V supply voltage (power-up phase) and after voltage breakdowns.

Furthermore, a reset pulse is generated after the procedure of the integrated watchdog is terminated: if the microcomputer is in a controlled operation, the watchdog timer is constantly retriggered, i.e. under normal circumstances it never stops counting. If the trigger pulse is missing for more than 1.6 s, a reset is generated automatically.

The reset outputs of the two monitoring circuits are connected with each other via open-collector drivers (wired-Or). That means, both microcomputers are always reset when a monitoring component generates a reset.

A reset can also be manually initiated by means of one of the two service interfaces (pin 7) or by means of key T1:
Normally, Schmitt trigger input V10 pin1 is connected via pull-up resistor R33 and R34 to Vcc. Actuating key T1 effects fast discharging of capacitor C5 via R32 – output V11/pin15 becomes active low. After releasing T1, C5 is slowly charged via R33. When reaching the switching threshold of V10, output V10/pin10 becomes high again. The time constant amounts to 0.2 s. Diode G9 effects fast discharging of capacitor C96/C97 even at a short voltage breakdown.

Key 'Test' (Monitor)

Key T2 (master) or T3 (slave) enables entering a special monitor program. For this purpose, hold this key down while performing a reset.
The terminal periodically displays characters, the software then expects entering a character. By means of this character, the baud rate of the terminal is automatically found. Subsequently, the prompt of the monitor is displayed. This program is a simple aid for software development, as well as for hardware trouble shooting for Philips service personnel.
While the computer is in the monitor mode, the red Error LED G3 or G10 is blinking. If, after the monitor program was started, no character is entered to the terminal, the main program is automatically entered after some seconds. The monitor mode can be also activated via the respective diagnosis interface (pin 9).

MASTER, LOCAL RESOURCES

Store

The 80C186 microprocessor comprises 20 address lines (A19...A0). Thus, the addressable storage area amounts to 2^{20} bytes = 1Mbyte.

This address space is divided up as follows:

Address	Block size	Store type	Pos. no.
E0000H...FFFFFH	128 k	E-Prom	V63, V64
60000H...DFFFFH	512 k	Flash	V56, V58
50000H...5FFFFH	64 k	Flash	V55, V57
40000H...4FFFFH	64 k	RAM	V110, V112 *
00000H...3FFFFH	256k	RAM	V47, V48

(*) global RAM

Address decoder

The programmable logic component PL894 (V59) contains the address decoder which generates the selection signals (bus RES1MCS<3..0) for all storage elements. The signals are derived from gating the most significant address bits 1AA19...1AA16 and the status signal 1S2*.

EPROM

The EPROM bank (V63, V64) contains a minimum system (operating system) which is operative without flash part. Furthermore, it contains all software modules required for loading the flash memories. These are:

– the flash programming algorithmus

– a communication software (”Kermit”) for programming via the diagnosis interface

– the network software for programming via Cheapernet.

Flash memory

The flash memories contain the real switcher operating software. These components can be electrically cleared and programmed. Software updates concerning only this part, can be performed ”in-system”, i.e. without removing the microcomputer from the plug-in frame. Programming is either made via the diagnosis interface from a PC or via the network from a control panel with floppy disk drive.

For clearing or programming, a programming voltage VPP of 12V has to be applied. It is generated with the DC/DC converter V62 from the 5V supply voltage. The programming voltage can be switched on and off via transistor V67 under software control. In the off-state, the components can be only read, i.e. they are write-protected.

With a block size of 64kB, only an eighth of the flash bank V55/V57 is faded into the address space. The three most significant address bits (bus RES1BS<2..0) are generated in the programmable logic component PL891 (V72). Switching these bits (under software control) enables addressing all eight blocks.

RAM battery buffering

The RAM components V51 and V52 are battery-buffered, i.e. their contents will be stored even in case of power failure. If power fails, these components are supplied by lithium cell T5. Switchover of the VBACK supply voltage to battery supply is made with V5.

The VBACK network furthermore supplies the components V110/V112 (global RAM), as well as the real time clock component V93.

The monitoring component V3 or V5 suppies the signal LL* (low-line, active low). With sufficient supply voltage, this signal is in the high state, the RAMs are enabled via the chip-select inputs CS2. If Vcc falls below a threshold value of approx. 4.8V, LL* becomes low, the RAMs are write-protected, independent of the state of the primary chip-select input.

The outputs LL* of the monitoring components are gated with each other (wired-OR) so that the write-protect function corresponds with the reset generation.

The supply voltage of the RAMs in the off-state amounts to approx. 3V. Buffering operates reliably down to a VBACK voltage of approx. 2V.

The supply current in the off-state lies within the microampere range. The cell has a capacity of 500mAh (milli-Ah), this means a lifetime of several years.

Cell T5 cannot be recharged.

Local-area network

The units of the Philips switcher family are connected via a local network. The local-area network (LAN) interface comprises a set of three chips:

LAN coprocessor (V17) is an intelligent peripheral component which handles the conplete transmit and receive process of data blocks (frames) via a network.

Memory accesses are made via the multiplexed addess/data bus MUX1AD<20..0. In this case, the coprocessor takes over the local bus by setting the CPU in the HOLD state and generating the bus control signals by itself.

During the coprocessor cycles, the LAN LED G2 is switched on.

The Ethernet serial interface (ESI, V54) is mainly charged with encoding/decoding the data from/into a special code (Manchester code).

The coaxial transceiver interface (CTI, V100) is a coax cable line driver/receiver for 50-ohm coax networks.

The potential separation required for networks, is made on the signal side via transmitter L1 and on the supply side via DC/DC converter V98. The latter one generates from the 5V input voltage (Vcc) a potential-free output voltage of -9V.

Math coprocessor

The math coprocessor (V7) is required for comprehensive calculations with floating point arithmetic. Data transfers are made – similar as for the LAN coprocessor – via the local multiplexed bus MUX1AD<20..0. Handshaking with the CPU, however, is not made via a hold/hold acknowledge protocol but via a special coprocessor interface in the CPU.

For application in the switcher D-family, the coprocessor is not required, therefore V7 and the associated oscillator T4 are not inserted.

RS 422 interface

Beside the diagnosis interface, also an RS422 interface is available at the master.

This interface is not accessible in the DD5 and DD10 switchers.

Compared with the three remote interfaces at the slave, there are the following differences:

– The pin assignment cannot be switched over, but is determined on the bus controller.

– The line drivers (V99, V90) cannot be disabled, but are always enabled.

– Optionally, synchronous data transmission with hardware handshake: Transmit and receive clock, as well as the handshake signals CTS (clear-to-send) and RTS (request-to-send) are also transmitted beside the data. With synchronous transmission, the baud rate amounts to 1Mbit/s.

– DMA (direct memory access) interface: for transmit and receive direction, one DMA request each to the CPU can be generated.

This interface is primarily used in the switcher for communication with an external crossbar. In this case, operation is made with an asynchronous data transmission (without handshake) with a baud rate of up to 38.4kbd, i.e. the above-mentioned synchronous interface is not used at present.

Real-time clock

Component V93 contains a real-time clock/calendar with integrated quartz oscillator. R/C element R136/C18 limits increase of the supply voltage. The component is supplied by the VBACK voltage, so that the clock continues running even in the off-state. When the supply voltage fails, the component is inactivated via the signal LL* (Low-Line), thus ensuring a write protection (functioning is similar to that of the buffered RAMs, see above). The 16 internal 4-bit registers (year, month, day, etc. tens and units digit), can be addressed in the address space 4201H...421FH (odds addresses) via INPUT and OUTPUT commands.

DIP switch

Via bus driver V69, the status of the DIP switches T77 can be read in under address 4221H. A closed switch (position ON) causes a ”0” in the corresponding bit.

LED row

The LED row comprising G13...G20, is controlled by the 8-bit latch V41. This component can be addressed under the address 4221H by means of an OUTPUT command. After every write cycle, the information remains stored in the internal latch. A ”1” in the data byte causes a lit LED.

The meaning of the LEDs depends on the momentary operational state and on the software version.

SLAVE, LOCAL RESOURCES

Store

For the slave, the 1Mbit address space is divided up as follows:

Address	Block size	Store type	Pos. no.
E0000H...FFFFFH	128 k	EPROM	V140, V142
60000H...DFFFFH	512 k	Flash	V139, V141
50000H...5FFFFH	64 k	not assigned	
40000H...4FFFFH	64 k	RAM	V110, V112 *
00000H...3FFFFH	256k	RAM	V131, V134

* global RAM

Address decoder

PL894 (V129), function as for the master.

EPROM

EPROM bank (V140, V142) same as for the master.

Flash memory

Same as for the master, with the exception that there is only one bank for the slave (V139, V141).

Programming is made either via the diagnosis interface of the slave (J7) from a PC, or via the network. Since the slave cannot directly access the network interface, data to be programmed are first transferred to the master and then transmitted via the global RAM to the slave.

RAM

Contrary to the master, the local RAM of the slave (V131, V134) is not battery-buffered.

Remote interfaces

Beside the diagnosis interface, three remote interfaces are available at the slave (channel A of interface component V149 as well as the channels A and B of component V156). The interfaces enable connection of external units, such as editing systems, DVE, etc. Two of the interfaces are dedicated RS422 interfaces, the third one can be configurated either as an RS422 or RS232 interface (software controled).

RS 422 interface

The pin assignment of the RS422 interfaces (9-pin socket parts, serial ports) depends on whether a unit remote-controls another unit or is controlled itself by another unit (bus controller or tributary in conformity with EBU/SMPTE nomenclature). The assignment of the interfaces to an external unit is optional, for this reason, the pin assignment can be switched over. Switchover is made via the relays T71...T76. The relays are switched over pairwise with the signals ES1TB* to ES3TB*. These outputs can be set or reset by a write cycle in a command register of the DUART components V149 or V156 under software control.

The bus drivers V88 and V90 are configurated as RS422 drivers by connecting pin 4 (MODE) to GND. The drivers can be switched via pin 3 or pin 6 into a high-resistive state. They are enabled via the signals ES1EN* to ES3EN* (active low). The enable signals ES2EN* and ES3EN*are gated via the OR gates V82/b and c with the signal PWRUP. This signal is active (high) during the initialization phase and disables the bus drivers until the DUART components are completely initialized. The capacitors C107...C110 limit the rise time of the signal edges on the outputs, thus avoiding reflections on the interface cables.

The receiver components V89 and V91 convert the push-pull interface signals again into TTL signals. The resistors R143,R140 and R139 effect a line termination which avoids reflections especially at long cables. Via the resistors R142, R138 and R137, a low offset current is fed to the receiver differential amplifiers. This current effects that, in the event of an open or shorted line, an applicable level is obtained at the output in any case (fail-safe connection).

RS 232 interface

Channel A of DUART V149 can be optionally configurated as RS422 interface or RS232 interface. The interface signals (2TXDADU1, 2RXDADU1 and 2RTSADU1*, TTL level) are switched via the analog multiplexer/demultiplexer V81 either to the RS422 drivers/receivers (V90/V91, see above) or to the RS232 driver/receiver (V71). Switchover is made via the DUART bit RS232/422*.

The signal PWRUP disables multiplexer V81 during the initialization phase. In this case, the RS232 interface will be in the inactive state.

V71 generates from Vcc the positive and negative supply voltage required for RS232. The increase of the supply voltage from V71 is limited with the RC element C17/R128/R129 to undangerous values.

LED row

LED row G21...G28 and latch V119 same as for the master.

SYSTEM BUS

Global resources are accessed via the system bus interface. The corresponding data bus tranceivers, address latches and buffers of the respective microcomputer become active, those of the other MC remain inactive (high-resistive).

The simultaneous bus request of master and slave first causes a conflict which is solved via a so-called arbiter.

Bus arbitration

A request for the system bus is derived from the address of the momentary bus cycle. Accesses to the global RAM are indicated by the signal 1BRQMEM*, those to global I/O resources by the signal 1BRQIO*. These signals are generated in the memories or I/O chip select decoders PL894 or PL895 (V59, V61). From these two signals, the common request signal 1BRQ* is generated in component PL898.

This analogously applies also to the slave.

The two request signals 1BRQ* (master) or 2BRQ* (slave) supply the bus arbiter V113. In principle, this is a priority encoder whose outputs show a defined behaviour:

The outputs 1BGT* or 2BGT* (bus grant) indicate the assignment of the bus system after a request (bus request). The arbiter component ensures that only one output can become active. In case of absolutely simultaneous requests, the master is the ”winner”. The outputs of the arbiter are free of glitches, even if both input signals changes simultaneously.

The signal at the arbiter output is asynchronous, referred to the respective CPU clock. For further processing, 1/2BGT* is synchronized with a synchronizer (V122/V124) to the respective system clock. The synchronized output signal 1/2SBGT* (synchronized bus grant) is evaluated in waitstate generator PL896:

The signal 1/2SRDY causes the CPU to create waitstates. When accessing the system bus, the momentary bus cycle is changed until the signal 1/2SBGT* has become active. As soon as assignment is made, the signal 1/2CEN* (command enable) is activated. This signal enables, for instance, the drivers of the address latches for the system bus. After the bus cycle is completed, the signals 1/2CEN* and 1/2BRQ* are disabled again, thus enabling the system bus.

System bus RAM

Data exchange between the two microcomputers is made via the common RAM (V110, V112). This RAM is mains-failure-proof buffered. The write protection operates similarly as that for the local RAM of the master with the signal LL* (low line)

From the 2x128kbytes, only 64 kbytes are faded into the address space, the remaining ones cannot be accessed.

Inter-processor communication

Indication of events between the two microcomputers is made with the interrupt component (V114). The signals 1/2INTOS (operating system interrupt) are generated in component PL892 (V114). An interrupt request can be generated for the local CPU as well as for the respectively other CPU.

I/O bus

The p.c. boards in the switcher plug-in frame are connected via the I/O bus with controller RY1601/1917. On principle, master as well as slave can access the I/O bus interface.

In the switchers of the D-family, data transfer to/from the video p.c. boards is exclusively made from the master. For this reason, some ICs which the slave would require for such transfers, are not inserted.

Data transfer between controller and video p.c. boards is made via a bidirectional data bus. Beside the conventional, parallel data transfer, a serial data transfer is realized on the I/O bus:

The difference to the parallel transfer is that the data are not transmitted in registers or latches but in shift registers (SR). Cascading builds chains of SRs which can be supplied with one databit only. Compared with latches, the advantage consists in saving data bits (i.e. pins) and keeping the decoding complexity at a minimum.

The bus cycles of parallel and serial transfers are identical, except the fact that data to be transferred serially, are first parallel-to-serial converted on the controller. The subsequent serial-to-parallel conversion in receiver SR effects for the software a transparent register structure.

Control signals of the I/O bus:

SEL_M_V01*..SEL_M_V18*:	Select signals for up to 18 p.c. boards.
DAT_M_2X00..DAT_M_2X15:	Bidirectional data bus, the data bits correspond with the bits SD00..SD15 of the system data bus.
ADR_M_2X00..ADR_M_2X13:	Address bus, the address bits correspond with the bits SA00..SA13 of the system address bus. ADR_M_2X00 'low' indicates a data transfer via the least significant byte of the data bus.
BHE_M_2*:	Bus high enable, indicates a data transfer via the most significant byte of the data bus.
PS_M_2:	Parallel/serial, indicates the transfer type. 0 : serial, shift register I/O 1 : parallel
DTR_M_2:	Data transmit/receive, indicates the transfer direction. 0 : periphery —> microcomputer 1 : microcomputer —> periphery
CP_M_2*:	Clock pulse, data transfer pulse, data are transferred during the low phase or shifted with rising edge.
PUP_M_2*:	Power-up, active (low) during the initialization phase, can be used to force a defined state.

Card-select decoder

Each slot in the plug-in frame is connected with one of the card-select signals SELMVxx*. This signal is an enable signal for the corresponding p.c. board, i.e. data can be only transferred when this signal is active (low).

The enable signals are generated in the programmable logic components V95 or V158. A defined block of the parallel address space and/or a defined block of the serial address space is assigned to each p.c. board. The respective block size and consequently the data quantity is defined in the above-mentioned decoders. The programmable decoders allow a flexible assignment of the address space to the individual p.c. boards.

The select signals are derived from the current address. It has to be noted that the local addresses RES1/2ADR<20..0 are used for decoding. This has the advantage that decoding can be started already from the beginning of the bus cycle, i.e. already during the arbitration phase.

In the switchers of the D-family, data exchange with the video electronics is exclusively handled by the master. For this reason, the slave need not generate select signals, therefore V158 is not inserted.

Parallel data transfers

Transfer of parallel data is made via the bus tranceivers V102 and V104.

As for the local bus, also for the I/O bus is differentiated between byte transfer (8 bits) and word transfer (16 bits). Byte transfers under even addresses are made via the data bits SD07..D00 and those under odd addresses via SD15..SD08. The transfer type is indicated by the signals SA00 (address 0) and SBHE* (bus high enable).

Parallel registers or their addresses are addressed with the commands ”INPUT” and ”OUTPUT” (’DICMAC ’ convention).

Serial data transfers

Each serial data interface comprises a number of output shift registers (serial-in/ parallel-out with integrated output latch) and read-in shift registers (parallel-in/serial-out) which are all cascaded. These are either discrete components (output e.g.: HCT4094T, input e.g.: HCT165T) or integrated SRs in ASICs or programmable logic components.

Serial registers or their addresses are addressed with ”PUT” (output) and ”GET” (input).
The PUT data are parallel/serial-converted on the controller before being fed to the external bus, and are again serial/parallel-converted by the receiver registers on the video p.c. boards. Therefore, the contents of a register after data transfer exactly corresponds to one byte in the memory.

The data (GET) to be read in, which are also available in serial form, are fed directly (i.e. without previous serial/parallel conversion) to the data bus. That means, that neighboring bits within a register after data transfer will be located in successive memory locations. These data are mainly individual status bits which cannot be handled by the system software as continuous 8-bit values anyway.

For the user (test aid ”DICMAC”), the different handling of PUT and GET data is not important since access is made in any case via logic register addresses.

Parallel / serial converter

The parallel/serial converter mainly consists of sixteen shift registers of the type HCT597T (V77,V79,...). The serial-converted data QMSB15..QMSB00 are buffered in the latches V166/V168 and fed to the external data bus (DATM2X00..15).

Beside the 8-bit shift register, the components HCT597T contain an input latch in which data are buffered (signal ST0*..ST7*).The PS converter is addressed word-by-word, i.e. with every write cycle (16 bits), two input latches are loaded.

The data from the input latches are transferred with the signal PSPL* (parallel load) into the proper shift registers. The shift registers are clocked with the signal PSSH* (shift).

The pulses for control of the complete logic are generated in the programmable logic components PL900 (V76 or V148). Since the slave does not access the I/O bus, V148 is not inserted. This component contains a ”state machine” for generating control signals, as well as a 3-bit counter which addresses via the 3-to-8 binary decoder V 147 one input latch each of the eight ones.

A write cycle causes the following procedure:

- One byte each is written into the input latches addressed by the counter. The counter is incremented, thus addressing the input latches of the next two shift registers.
- All sixteen SRs are clocked simultaneously, the data appearing at the outputs ”QMSBnn” are transferred to V166/V168.
- After eight write cycles, a load pulse SHLD* is generated, the data from the input latches are simultaneously transferred to the shift registers. The counter gets a carry, thus addressing again the first input latch.

Address nomemclature

To each shift register is assigned one clear logic address (not to be mixed up with hardware port addresses). This address is composed of the following parameters:

1. Data bit (string) to which the corresponding register chain is connected
2. Page(s) being occupied by this board (defined in the card-select decoder, see above)
3. Register number (place where this register is located within the chain)

In the following text, the registers or the corresponding addresses are named ”PUT” (write direction) and ”GET” (read direction).

The register indices of the PUT registers are counted in shifting direction of ”0” in ascending order, starting from the bus coupling (data bit). The register indices of the GET registers are counted opposite to the shifting direction of ”3” in descending order, starting from the bus coupling.

PUT range:

string:	0 ... F	(15, hexadecimal)
page:	0 ... B	(11, hexadecimal, PUT)
register:	0 ... 7	(PUT)

Applicable logic addresses: 000 ... FB7

GET range:

string:	0 ... F	(15, hexadecimal)
page:	0 ... 2	(GET)
register:	0 ... 3	(GET)

Applicable logic addresses: 000 ... F23

Tally/GPI interface

The GPI (general-purpose interface) or tally interface is controlled in the same way as the video boards.

The GPI or tally-in information is read in parallel via the bus drivers V34, V35 and V36 which drive the least significant byte of the system bus.

The slide switches T47,T48,T49,T56,T57,T58,T67,T68 are assigned to the GPI inputs 1 to 8. These inputs are provided with optocouplers. The switches configurate the hardware interface:

Switch position ”1” or ”left”:

A simple connection between the two connectors activates the corresponding input. This kind of control is suited for a connection to a relay contact or to an open-collector output. Note that in this case, one of the two lines is connected with the circuit ground. For this reason, when connecting to an open-collector output, there is no ground potential isolation between switcher electronics and controlling device.

Switch in position ”2” or ”right”:

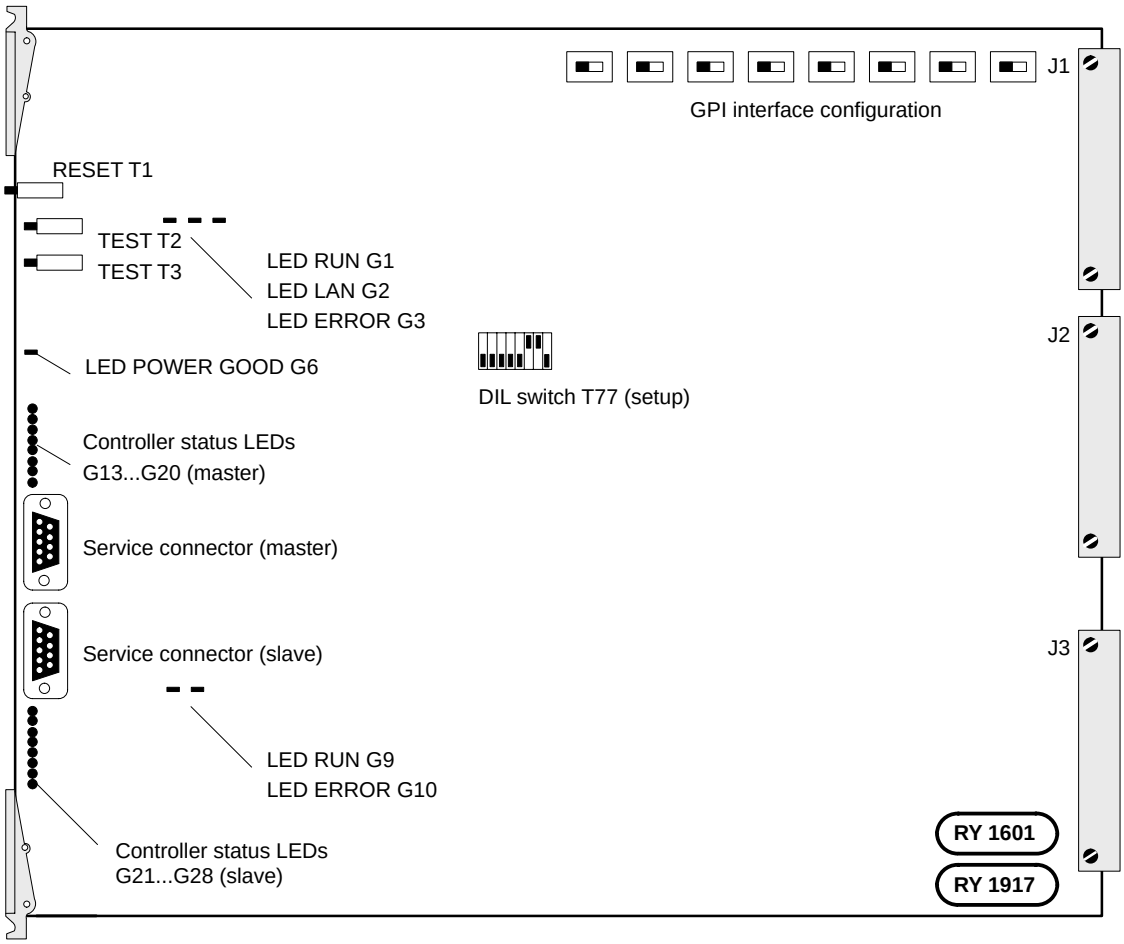
The optocoupler-internal LED (including the 1k drop resistor) is made available at the two connectors. This kind of control provides a ground potential isolation, the controlling device, however, has to impress a current upon the LED, i.e. a simple contact is not suited in this case.

The function of the GPI inputs depends on the installation.

The tally inputs are controlled by connecting the respective input to ground (no galvanic separation). Control can be made by a relay contact, switch or an open-collector output.

The GPI or tally-out information is transmitted in serial form to the registers V32, V30, V28, etc. The corresponding relays are controlled via open-collector drivers V33, V31, etc.

The signals for controlling the GPI/tally interface are generated in the programmable logic component PL893 (V18).



*Key **RESET** (T1)*

Microcomputer reset. Simultaneous resetting of the master and the slave microcomputer.

*Keys **TEST** (Master T2) (Slave T3)*

If these keys are pressed when releasing the reset key, the respective microcomputer does not enter the normal operating program but the so-called ”monitor” mode.
This is a minimum system which is operative in the EPROMs. For the duration the microcomputer is in the monitor mode, the red error LED will blink.

This mode is intended for Philips-internal use only.

The switches have the following functions:

*DIL switch **SETUP** (T77)*

8-fold switch T8 for adjusting the device type. The respective switch position is only inquired after a reset, i.e. a change of the switch position becomes only effective after a reset.
The switch position can also be inquired at the service terminal with the program selection ”V” (software version).

The switches have the following functions:

Switch	**Position** **On = 1** **Off = 0**	**Meaning**
1		unused
2...4	 000 001 010 011 100 101 110 111	Device type of box: DD30 box DD10 box DD20 box DD5 box unused unused unused unused
5 ... 8		unused

*LED **POWER GOOD** (G6)*

Voltage monitoring, lights as soon as the 5V supply voltage of the p.c. board is high enough. Below this threshold, both microcomputers are permanently kept in the reset mode.

*LEDs **RUN** (Master G1) (Slave G9)*

”Lamp of life” of the microcomputer, is switched on with each bus cycle of CPU or LAN coprocessor. If these LEDs do not light, there will a fatal error (no bus activities).

*LED **ERROR** (Master G3) (Slave G10)*

Blinks in the monitor mode (see above, Philips-internal use). Error indication is made with the LED row STATUS.

*LED **LAN** (G2)*

Network activity indicator, is switched on with each LAN coprocessor cycle. The LED serves the qualitative judgement of the line load.

*LED row **STATUS** (Master G13 ... G20) (Slave G21 ... G28)*

Status indicator of the power-up test. See the chapter ”Diagnosis” in the section ”Error Diagnosis”.

LED	**Test**
G13/G21	RAM-Test
G14/G22	Service-Term (DUART 1 Channel B)
G15/G23	INT3-Test
G16/G24	EPROM-Test
G17/G25	DUART 1 Channel A, DUART 2 Channel A + B
G18/G26	INT2-Test
G19/G27	Hardware I/O
G20/G28	unused

At the beginning of the test, all used LEDs are lit. After having passed the test, the associated LED is switched off. Switching-off is made from the left to the right. This, however, is hardly perceptible when powering up, since the checks – except for the RAM and EPROM checks – are very fast
If a certain test failed, the LED stays lighted. An exception is the lowest LED G20 which indicates during normal operation the error ”NO CHEAPERNET COMMUNICATION” in addition to the running light.

When all tests have been passed, a kind of running light appears on the LED row. This shows immediately whether the controller operates in the normal mode.
The running light is operated by the microcomputer only if it is not occupied with something more important.

Thus, the speed of the running light allows a qualitative judgement of the computer activity.

GPI configuration *(T47-T49, T56-T58, T67, T68)*

The slide switches T47, T48, T49, T56, T57, T58, T67 and T68 are assigned to the GPI inputs 1...8 (general-purpose inputs). These inputs are provided with optocouplers. The switches enable matching the inputs to the different control concepts:

Switch in position ”1” (position ”left”)

A simple connection between the two connectors activates the corresponding input. This kind of control is suitable for a connection to a relay contact or to an open-collector output.

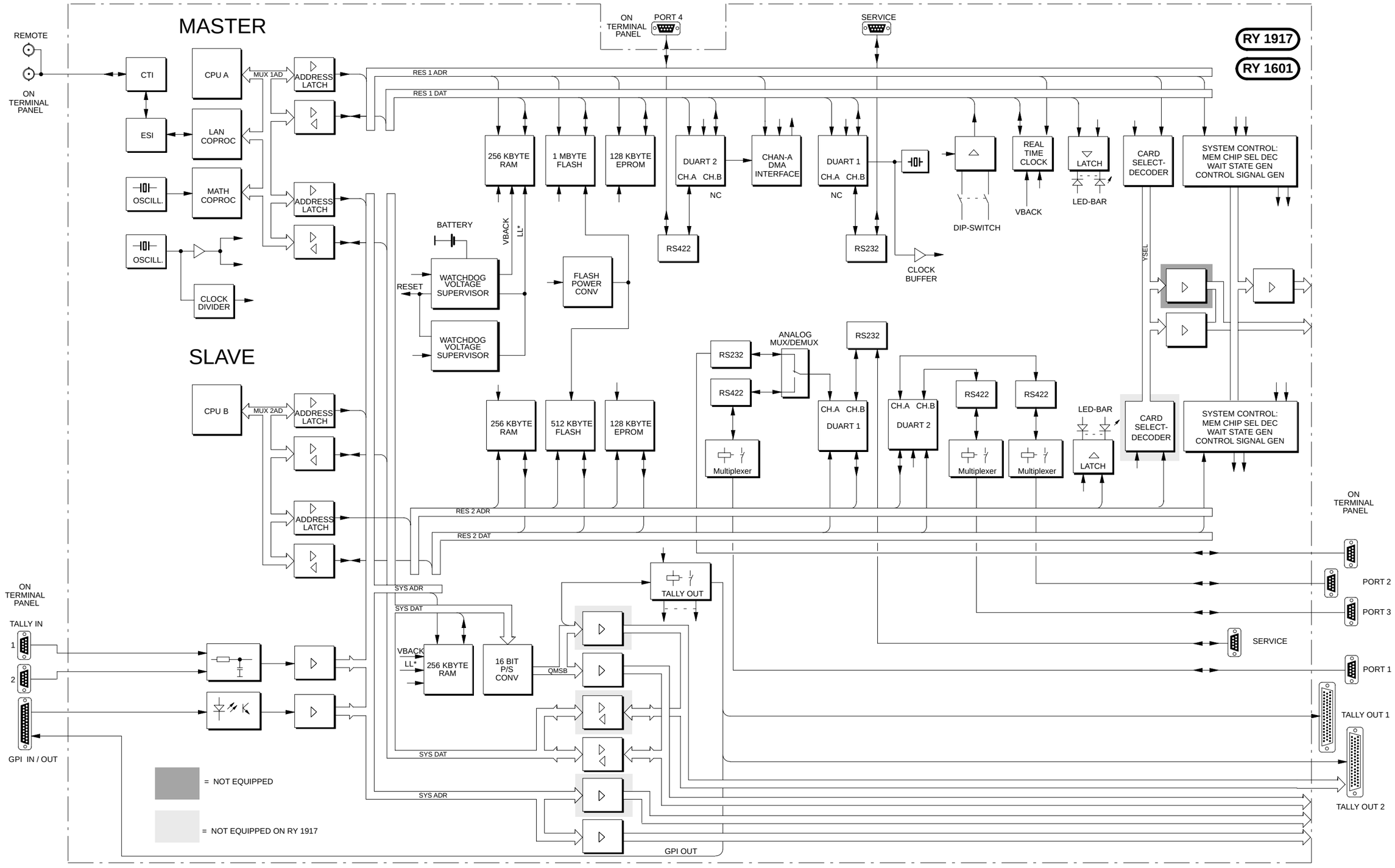
Attention: In this case, both lines are connected with the circuit ground. When connecting to an open-collector output, there is no ground potential isolation between the switcher electronics and controlling devices.

Since the circuit ground is led out of the device, the cabling has to be shielded for this kind of control. Non-shielded cables may cause EMC and/or ESD problems!

Switch in position ”2” (position ”right”)

The optocoupler-internal LED is made available at the two connectors (including 1kΩ drop resistor). For this kind of control, a ground potential isolation is provided; the controlling device, however, has to impress a current upon the LED, i.e. a simple contact is not suited in this case.
Due to the ground potential isolation, the cabling is less critical for this kind of control.

Block diagram of controller RY 1917/RY 1601



3.17 CONNECTION UNIT RMD 5/10

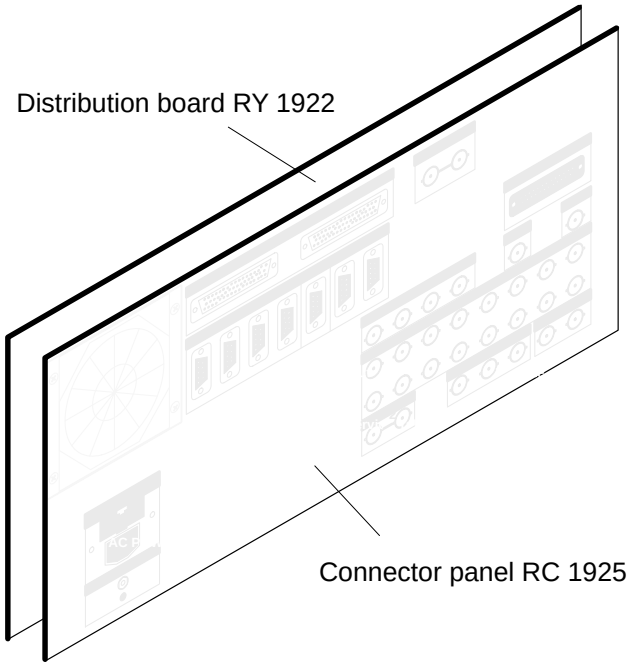
The connection unit is located at the rear of the E-box and consists of a distribution board RY 1922 and a connector panel RC 1925.

Connector panel RC 1925

The connector panel carries all connector sockets described in the Planning and Installation Manual.
Furthermore, the connector panel carries a soldered hybrid board RM 1923. The serial number of the switcher is electrically stored on this board.

Distribution board RY 1922

The distribution board carries the p.c. cards of the video and control electronics as well as the power supply.



3.18 CONNECTION UNIT RMD 20/30

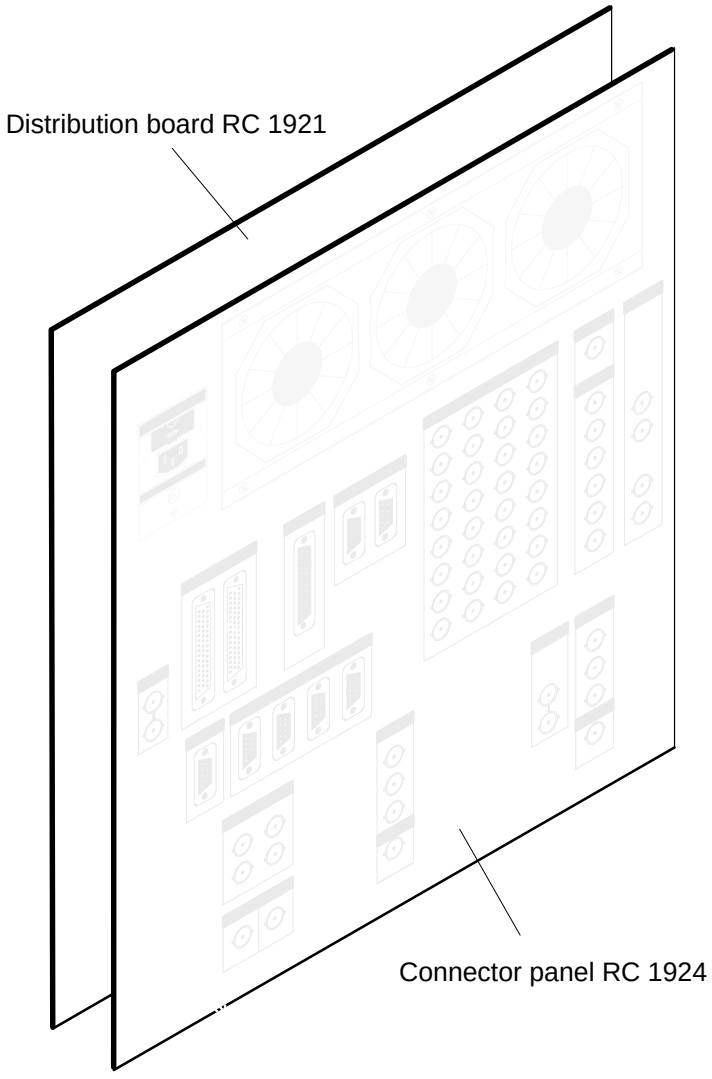
The connection unit is located at the rear of the E-box and consists of a distribution board RY 1921 and a connector panel RC 1924.

Connector panel RC 1924

The connector panel carries all connector sockets which are described in the Planning and Installation Manual.
Furthermore, the connector panel carries a soldered hybrid board RM 1923. The serial number of the switcher is electrically stored on this board.

Distribution board RY 1921

The distribution board carries the p.c. cards of the video and control electronics as well as the power supply.



3.19 KEY PROCESSOR 2 RY1943 / RY1944

Overview

The key processor board of the DD switcher family includes four key paths. The keyers 1 and 2 are the main key paths and can be used as chromakeyer or lumakeyer. They generate either a chromakey signal or a lumakey signal. Keyer 3 is a luminance keyer. In DD5 and DD10, it serves as a dowstream keyer, in DD20 and DD30 as a mask bus or as layer key in layering mode . Keyer 4 serves as a DVE keyer or as layer key in layering mode.

The first three keyers include a mask NAM for gating key and mask. Key invert, mask invert, force foreground, key off, mask on, as well as blanking of the keys are elementary functions of this stage. It generates a mask preview signal which also represents the processing procedures of the mask store if required. For this purpose, the applied mask signal is gated with the cursor signal of the mask store. For linear key masking, the mask NAM supplies the linear mask to the ME board (chromakey as well as lumakey can be operated in the DD switchers as a add key).

To each mask NAM a mask generator is assigned which generates a rectangular mask. Alternatively, it is possible to select via the key pre-crossbar a key signal, a wipe signal or a signal stored in the mask store and to pass it on as a mask signal via the mask generator to the mask NAM.

The two first mask NAMs are connected with one desat generator each. From a chromakey signal, they generate the CANnx signals which are used on the ME board for improving the chromakeys.

The mask store can be either used as a delay stage for key signals or as a store for mask signals. The paint, rub, clear, shift und freeze functions enable ”painting” own masks. As a ”brush”, either wipe signals or key signals are used. From the input signal, the mask store derives the cursor signal which is fed to the mask NAMs for visualizing the processing procedure of a mask.

The borderliner provides the effects Border and Outline (1H, 2H each), Shadow and Dropshadow (1H, 2H, 3H, 4H each) as well as Far Shadow. For the latter effect a store of the montage store board (DD20, DD30) is used.

In the borderliner, a chromakey enhancement stage is integrated which enables suppression of slight shadows of the chromakey background and to a small extent also noise suppression in the key signal for further improvement of the chromakey. These functions are realized by a clip&gain stage.

A further task of the key pre-crossbar is the assignment of the two borderliners to the first three keyers. This assignment is not fixed, but results from the control concept of the switcher. In order to be able, nevertheless, to border a downstream keyer when using two chromakeyers, a delay stage is provided which also includes an enhancement stage and which is used instead of a borderliner for separating the key signal into two separate channels. The rank possibilities of the key pre-crossbar always enables finding an appropriate assignment of borderliner and delay stage to the keyers.

The key-out crossbar finally serves the ranking of the (bordered) keys 1 to 3, the DVE keys, the wipe signals and the four wipe voltages Key 1 Mix, Key 2 Mix, Key 3 Mix and BGD Mix. In addition, the key-out crossbar offers – in the same way as the key pre-crossbar – the two signals 0 % and 100 % as virtual inputs.

The INNER signals as well as the An, Bn, Cn and Dn signals are fed to the ME board. The first ones are used for borderliner effects, standard chromakey and luminance selfkey, and the latter ones for all key and mix effects.

Output COLBGST goes to the color background store on the output processor board and serves the modulation of a matte by a key signal.

Output TOVEK is a serial 270 Mbit output. Together with input FRVEK it constitutes an interface for an external effects unit (e.g. DVE).

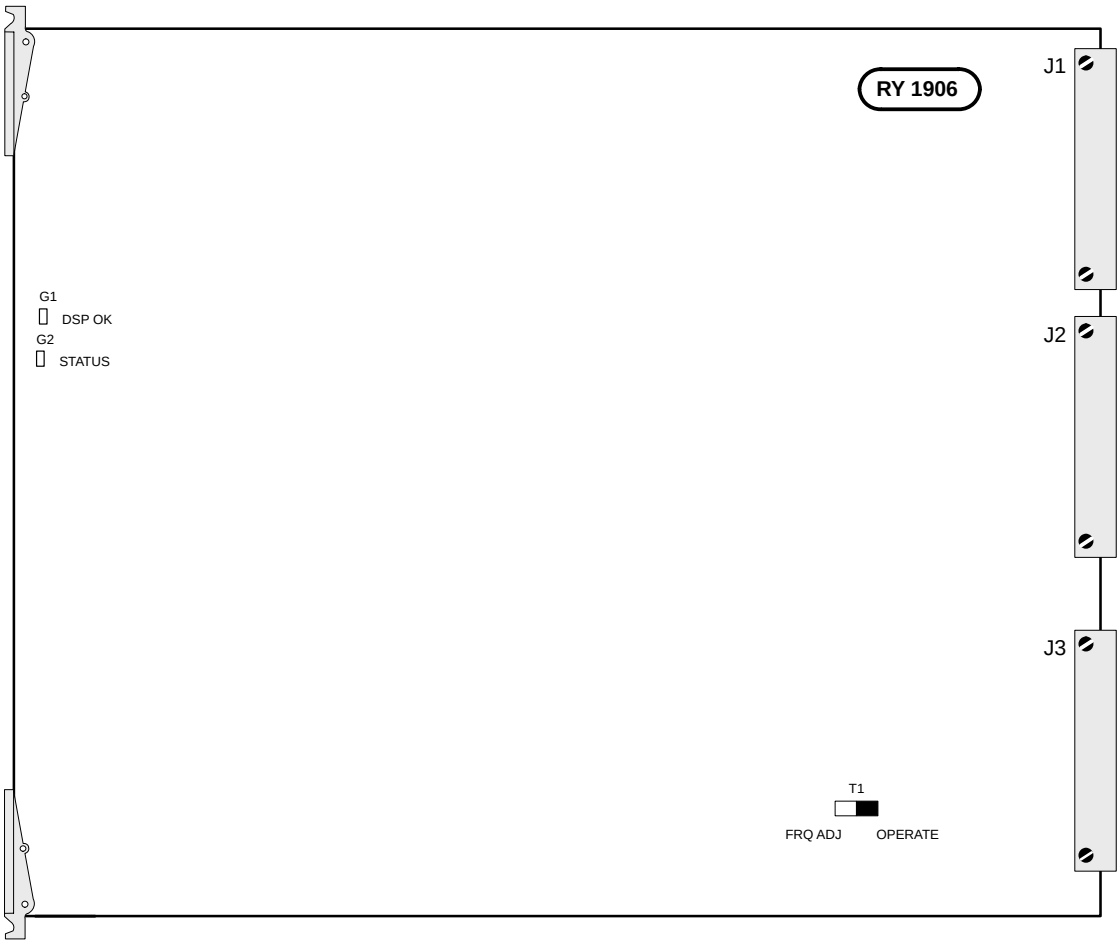
Analogously, output TOSTSH constitutes together with input FRSTSH an internal interface for the montage store board (DD20 and DD30 only).

Generating the key signals

The input signals are splitted in a demultiplexer in the components Y, CB, CR. The keyers with chroma key contain additionally a separate Y channel for luminance key. For avoidance of alias effects, the chrominance signals first go through an oversampling stage. After several mathematical processes, the chroma key signal is standardized in a clip and gain stage. In this stage, the clip and gain processing for luminance key is also done. This key signal can be positioned with the following filters and a NAM stage and adjusted in size and edge steepness.

When operating the keyers manually, the switcher control writes the key parameters together with an operation code into the Dual Port RAM and subsequently initiates an interrupt. Thereupon, the DSP stage analyzes the operation code and computates from the parameters the associated control datas.

When a keyer has to be adjusted automatically, an analysis of the video data of the key source will be required. The DSP stage recognizes the associated operation code and initiates the sampling of the selected key source. The Daka sampling stage loads the video data into the Daka RAM. From there, they are read by the DSP stage which makes an analysis of the picture data for finding the new key parameters. After having found the key parameters, the switcher control takes over these values from the DSP stage for actualizing the switcher status and initiates a ”manual control” of the keyer with the new parameters. Subsequently, the procedure above is started.



*LED **STATUS** (G1)*

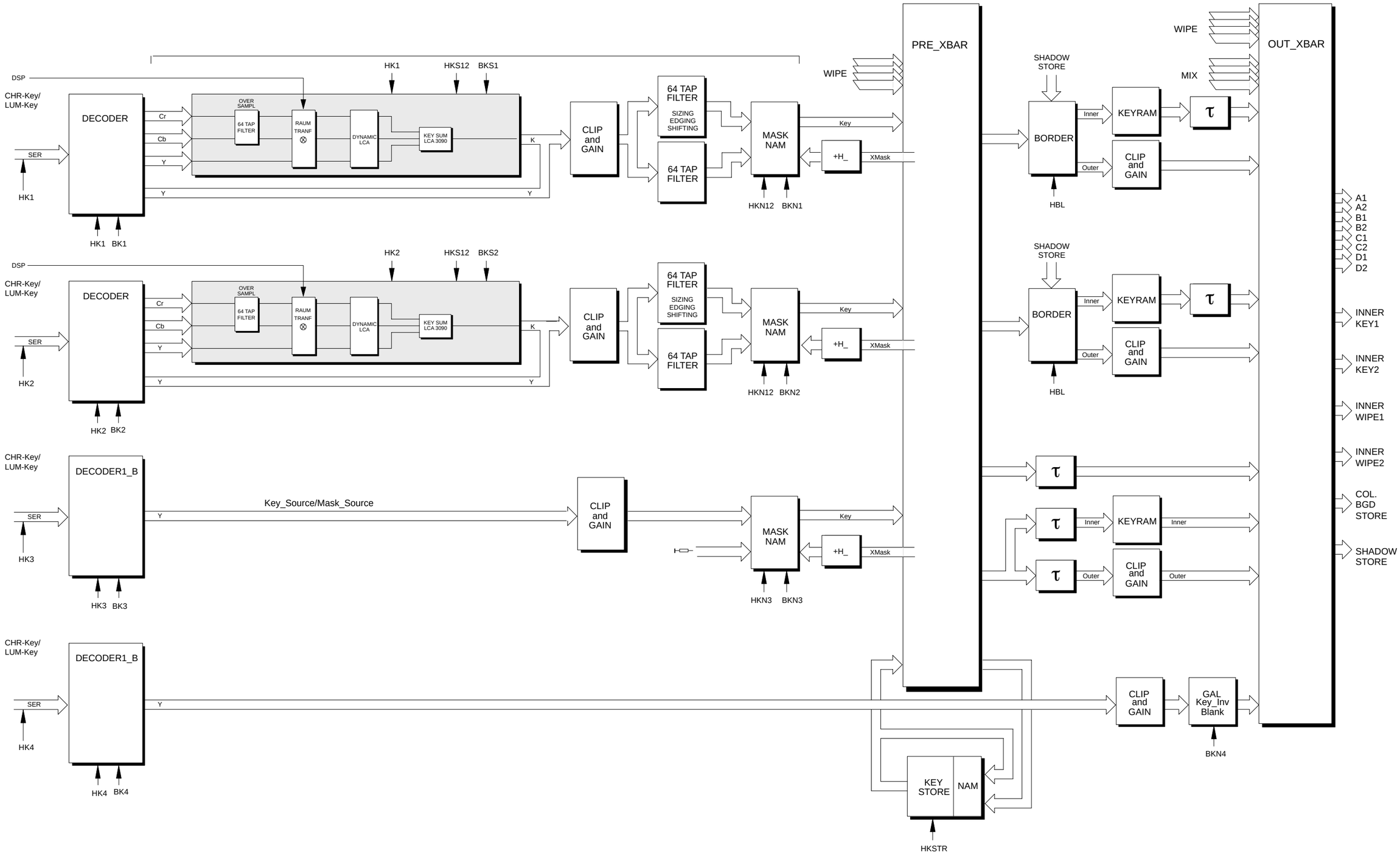
The status LED is a two-colored LED display and is switched off when switching on the unit or resetting the E-box. After having terminated a diagnosis, the lit LED is green, i.e. the p.c. board operates correctly.
When detecting an error on the p.c. board, the status LED is not lit.
If the lit LED is red, slide switch T3 is set to FREQ ADJ and the p.c. board is in the adjust mode.

*Switch **FREQ ADJ** (T3)*

In normal operation, the switch has to be set to OPERATE.
Setting the slide switch from OPERATE to FREQ ADJ enables adjustment of the VCOs in the interface components for serial data.
The adjustment is not described in details in the Service Manual, since it can be performed by Philips only!

ATTENTION!
Changing the positions of switch T3 causes functional disturbances of the switcher.

Block diagram Key-Processor RY 1943/RY 1944



3.20 POWER SUPPLY OF THE CONTROL PANELS

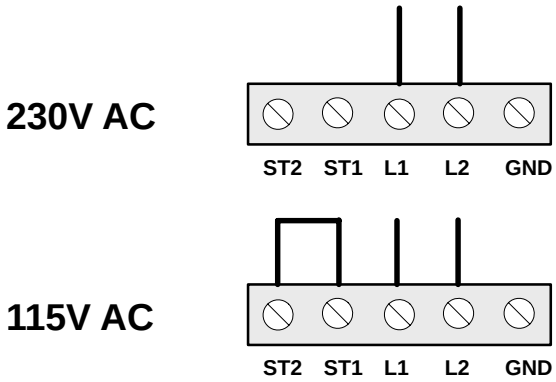
Line voltage

The line voltage of 115V or 230V for control panel RPD 5 is adjusted on power supply board RC 1882.
For the control panels RPD 10, RPD 20 and RPD 30, adjustment is made on power supply board RC 1824.

Modification

In spite of the different types of power supply units, modification for operation with another line voltage is equal for all units and has to be carried out as follows:

1. Switch off the control panel and and disconnect it from power (pull the plug).
2. Tilt up the control panel cover.
3. Change the connections of the lines at the power supply connector (see the figure).



4. Close the control panel cover.
5. Connect the unit to power and switch it on.
6. Correct the power indication on the connector panel.

Fuses

The control panel is fused with two fuses (10A/slow-blow). The fuses are located at the power input on the connector panel.
When changing fuses or operating with another line voltage, it is mandatory to use only fuse links of the same type and current rating as a replacement.
Using mended fuses or shorting the fuse holder is not permissible.

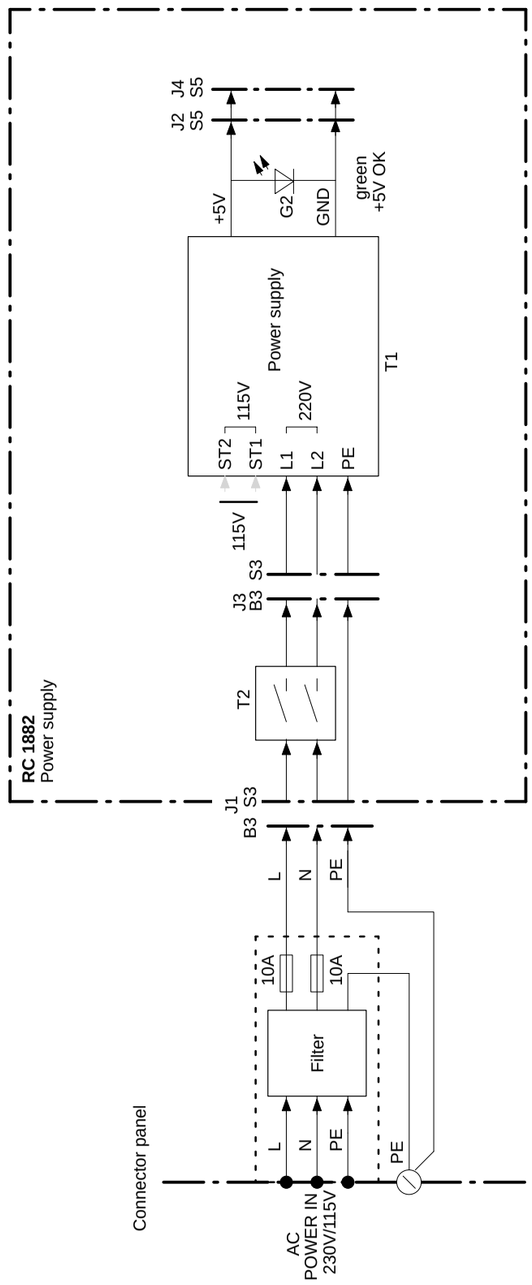
Power supply

The switch-mode power supply unit generates a voltage of +5V.
A monitoring circuit protects the power supply unit against short-circuit, excess temperature and excess voltage at the output.

Earthing

The control panel is connected to earth via the protective conductor of the mains cable (PE). The protective conductor should exhibit a cross-section greater than that of the mains cable neutral conductor N, at least however 2.5 mm^2 (VDE 0800/Part 2, Table 1).
Further details are contained in the Planning and Installation Manual, section 5.1 ”Connecting Power and Earth Lines”.

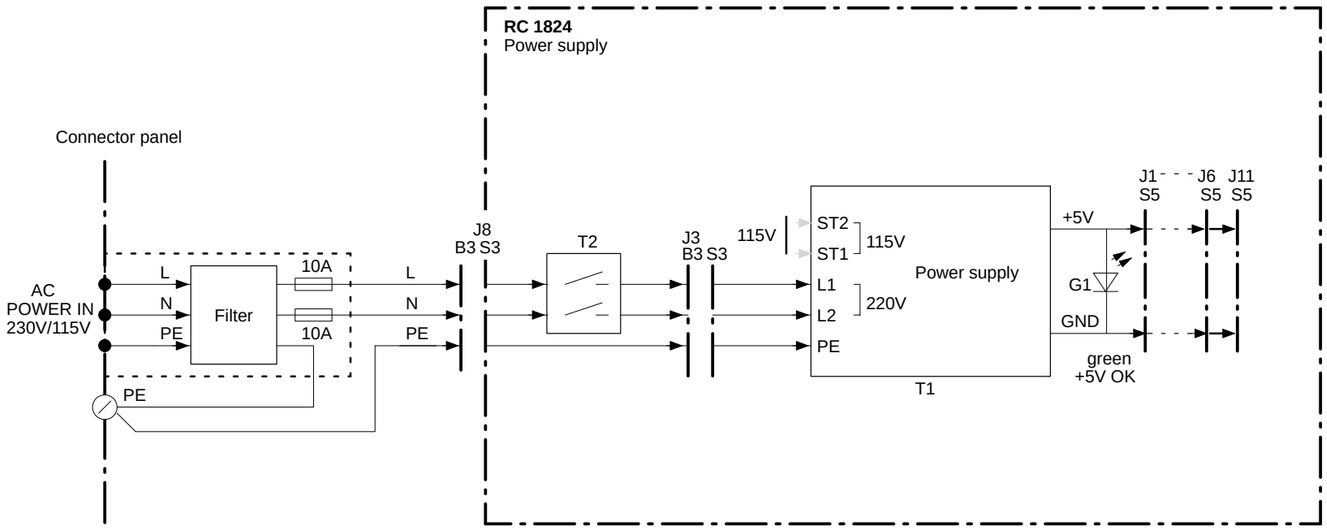
Block diagram of power supply RPD 5



DC voltage supply:

RPD 5

J2 –> RY 1821/J15, controller
J4 –> RX 1880/J2, keyboard



DC voltage supply:

RPD 10

J5 –> RX 1850/J3, crossbar selection
J6 –> RX 1852/J13, transition keyboard
J11 –> RY 1821/J15, controller

RPD 20

J1 –> RX 2004/J2, EXTRA selection
RX 2005/J5, chromakey selection
J2 –> RX 2003/J12, transition
RX 1816.12/J2, wipe module 2
J3 –> RX 2002/J2, crossbar selection
J4 –> RX 1819/J2, display module
J5 –> RX 2001/J2, crossbar selection
J6 –> RX 2000/J2, display board
J11 –> RY 1821/J15, controller

RPD 30

J1 –> RX 1800, crossbar selection ME
RX 1802, crossbar selection PP
J2 –> RX 1801, crossbar selection ME
RX 1803, crossbar selection PP
J3 –> RX 1806, transition ME 1
RX 1803, crossbar selection PP
J4 –> RX 1811, chromakey selection
RX 1812, EXTRA selection
J5 –> RX 1818, store module
RX 1819, display module
J6 –> RX 1816.11, wipe module
RX 1817, mask module
J11 –> RY 1821/J15, controller

3.21 POWER SUPPLY OF THE E-BOXES

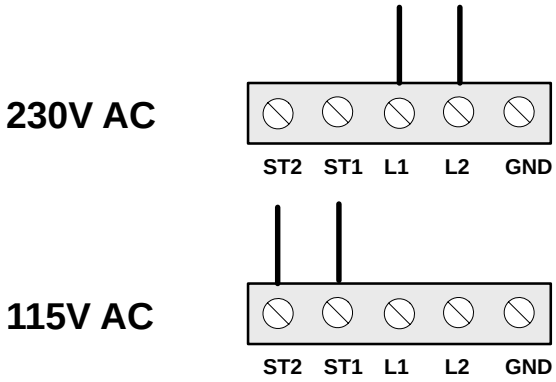
Line voltage

The line voltage of 115V or 230V for the E-boxes RMD 5 and RMD 10 is adjusted on power supply board RC 1929.
For the E-boxes RMD 20 and RMD 30, adjustment is made on the five power supply boards RC 1926.

Modification

In spite of the different types of power supply units, modification for operation with another line voltage is equal for all E-boxes and has to be carried out as follows:

1. Switch off the E-box and and disconnect it from power (pull the plug).
2. Open the door of the E-box.
3. Take the power supply (for RMD 20/30 all five power supply units have to be modified) out of the frame and change the connections of the lines at the power supply connector (see the figure).



4. Re-place the power supply unit to the frame.
5. Connect the unit to power and switch it on.
6. Correct the power indication on the connector panel.

Fuses

The E-boxes are fused with two fuses each (10A/slow-blow). The fuses are located at the power input on connector panel RC 1925.
When changing fuses or operating with another line voltage, it is mandatory to use only fuse links of the same type and current rating as a replacement.
Using mended fuses or shorting the fuse holder is not permissible.

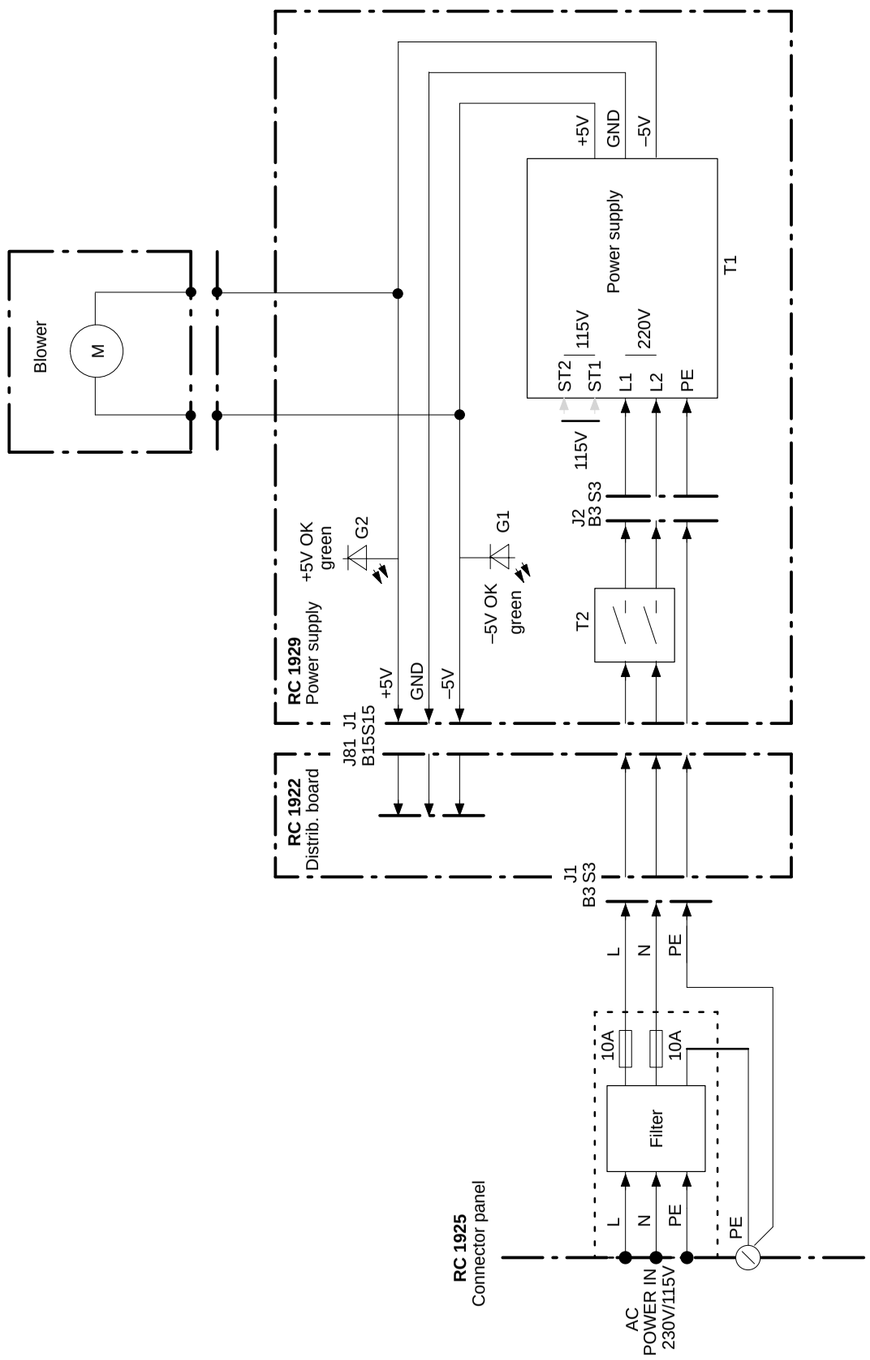
Power supply

The switch-mode power supply unit generates a voltage of +5V and –5V.
A monitoring circuit protects the power supply unit against short-circuit, excess temperature and excess voltage at the output.

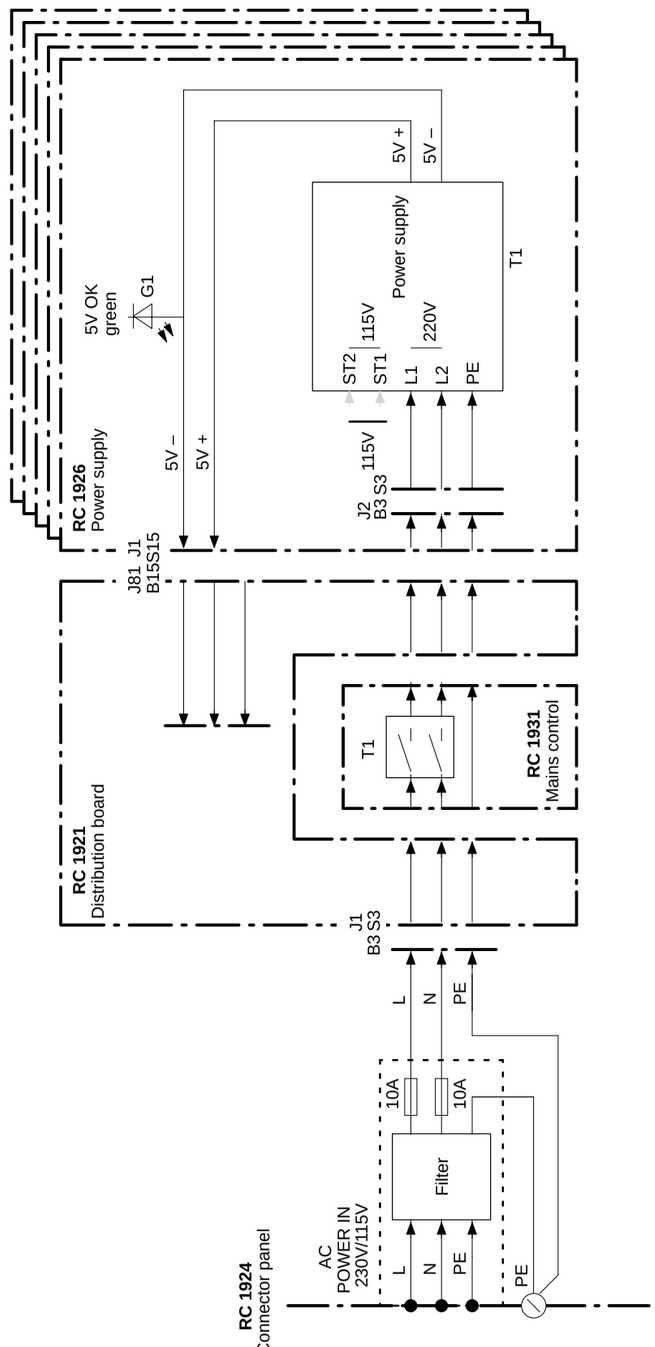
Earthing

The control panel is connected to earth via the protective conductor of the mains cable (PE). The protective conductor should exhibit a cross-section greater than that of the mains cable neutral conductor N, at least however 2.5 mm^2 (VDE 0800/Part 2, Table 1).
Further details are contained in the Planning and Installation Manual, section 5.1 ”Connecting Power and Earth Lines”.

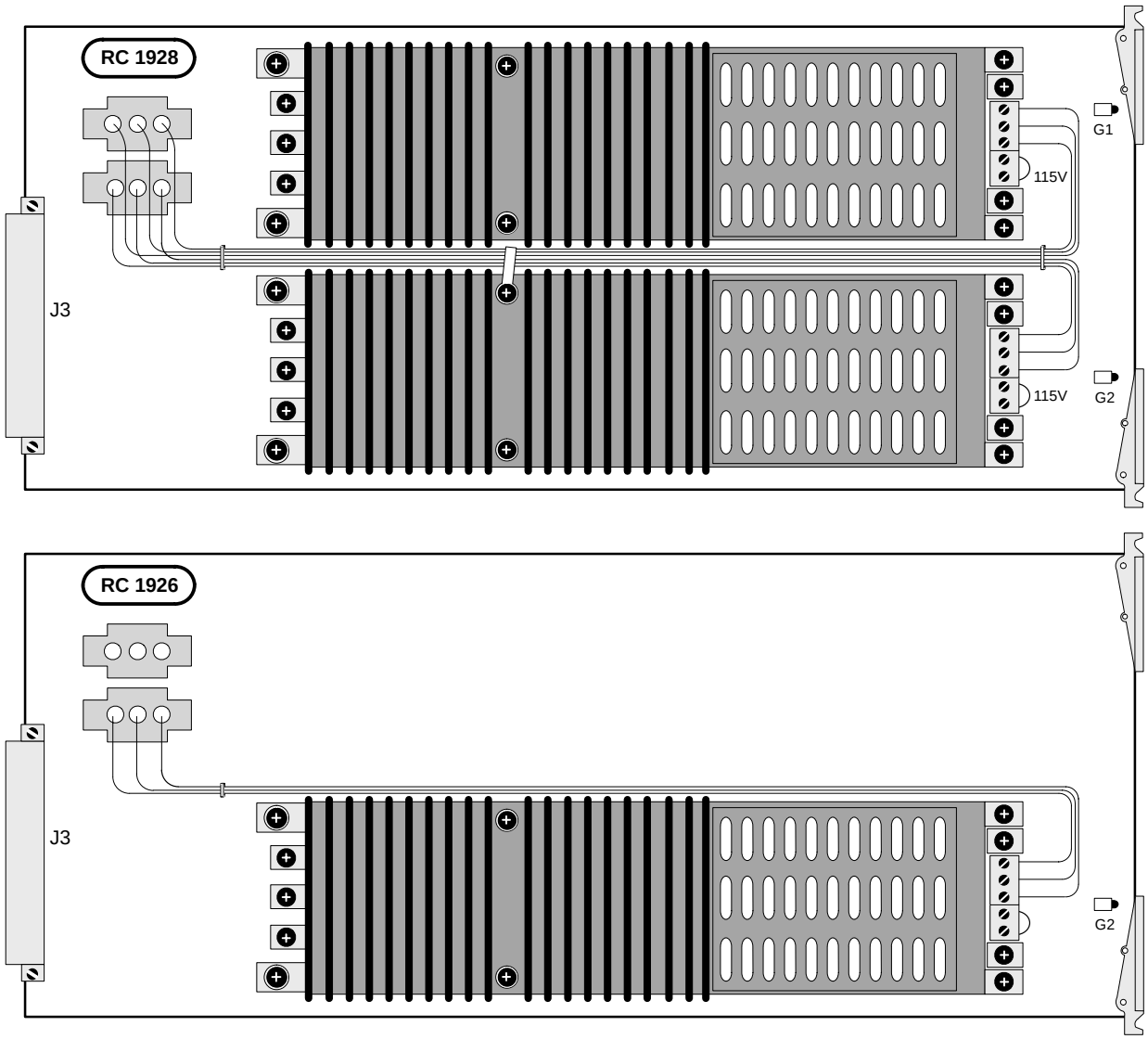
Block diagram of power supply RMD 5/10



Block diagram of power supply RMD 20/30



Power Supply Unit RC1926 / RC1928

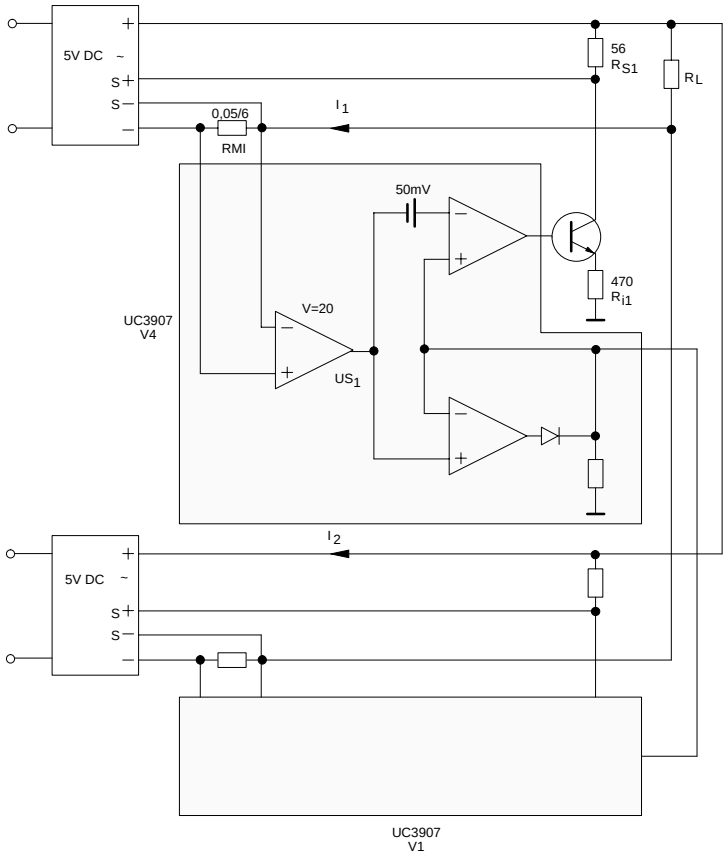


The used power supply units concern the following power modules:

- Vicor power supply unit 5V/200W
- DC-Output Uout = 4,8...5,2V
  $I_{nom-max}$ = 30A
- AC-Input 115V/230V AC (90...135V, 180...270V), f = 47...63Hz
- Efficiency 80...90%
- Ipeak: 54A (115V), 27A (230V)
- VDE/FCC class B

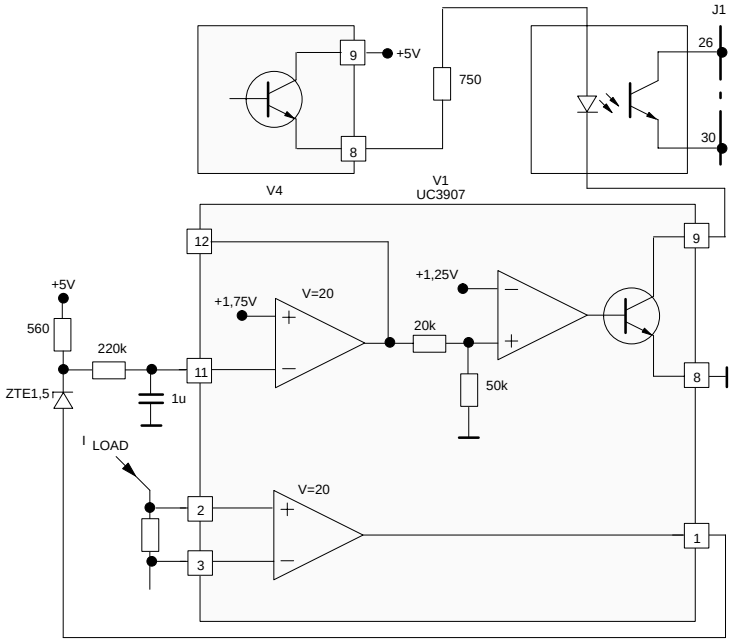
The power supply unit RC 1926 is equipped with one of these power modules:
RC 1928 is equipped with two moduls.
In case of RC 1928 the load charing between the two modules is controled via a automatic load share controller.

Automatic load sharing for RC1928



Automatic load sharing via controller UC3907

The power supply unit which supplies the highest current to the common load resistor R_L deterring the voltage level of the Share bus line via the current measuring circuit and the voltage follower. If this level is higher than the level generated by the current measuring circuit, the current through transistor Tbm, sense resistor R_S is increased so that the power supply unit with the low current is readjusted to the higher current until I_1 and I_2 are equal.
The following circuit part of the UC3907 supplies the Power-Fail measurement at controller connector J8.


J1
26
30
9
+5V
750
8
V4
V1
UC3907
12
9
+5V
560
220k
11
ZTE1,5
1u
+1,75V
V=20
+1,25V
20k
50k
8
I LOAD
V=20
2
3
1

4. DIAGNOSIS

4.1 POWER-UP DIAGNOSIS

The **power-up diagnosis** is a selftest which is automatically and separately carried out when switching on or resetting the electronics boxes RMD 5/10/20/30 or the control panels RPD 5/10/20/30.
Furthermore, it is possible to start the power-up diagnosis via the service interface with an external terminal or directly via the display of the control panels RPD20 and RPD30 (see section 4.2, ”Service Menu”).

4.1.1 E-box RMD 5/10/20/30

In the respective electronics boxes of the switcher families, the power-up diagnosis is carried out by two independent microcomputers (master and slave) on controller board RY 1601 or RY 1917 (depending on the equipment).

Tests

The following tests have been carried out:

1. RAM test.
   The volatile user data range is checked and filled with 00.
2. DUART test.
   Internal loopback test for:
   - DUART 2 channel A
   - DUART 2 channel B
   - DUART 1 channel A
   - DUART 1 channel B (device terminal)
3. Interrupt 3.
   Interrupt of DUART 1 for the Service menu.
4. EPROM test.
   Checking the check sum of the EPROM bank.
5. Interrupt 2.
   Interrupt for the operating system.
6. Video hardware.

Test procedure

At the beginning of the test, the two controller status LED rows (master: G13...G20, slave: G21...G28) on the controller board are lit.
After having passed the test, the associated LED is switched off. Switching-off is made from the left to the right or from top to bottom depending on the position of the controller board. This, however, is hardly perceptible when powering up, since the tests – except for the RAM and EPROM checks – are very fast.
If a certain test failed, the LED stays lighted.

An exception is the right or lowest LED which indicates during normal operation the error ”NO CHEAPERNET COMMUNICATION” in addition to the running light.

When all tests have been passed, a kind of running light appears on the LED row. This shows immediately whether the controller operates in the normal mode.
The running light, however, is operated by the microcomputer only if it has not to perform further processes.

Note:
The speed of the running light allows a qualitative judgement of the computer activity.

Running light slow = MCP heavily activated
Running light fast = MCP hardly activated

Error indication

If the power-up diagnosis finds an error, at least one of the two red LEDs on the controller will be lit.

ERROR LED = G3 (master)
ERROR LED = G10 (slave)

Kind of error

In order to determine the kind of error, there are different possibilities to display the error messages:

- Via two controller status LED rows (master/slave).
- Via an external service terminal (e.g. PC, VT100).
- Fom an external service terminal via the Service menu.
- Via the control panel display (RPD 20/30 only).

Controller status LED row

1. Error indication is made by two controller status LED rows (master G13...G20/ slave G21...G28) on the controller board.
   If a certain test failed, the associated LED stays lighted.

   To the individual LEDs, the following errors are assigned:

LED Master/Slave	Error
G13/G21	RAM
G14/G22	Service-Term (DUART 1 Channel B)
G15/G23	INT 3
G16/G24	EPROM
G17/G25	DUART 1 Channel A, DUART 2 Channel A + B
G18/G26	INT 2
G19/G27	Hardware I/O
G20/G28	unused Cheapernet

Service terminal

2. Error indication is made by an external service terminal (e.g. VT100).
   The error is indicated on the screen as follows:

   `FAILURE : xxxxx`

NOTE!

When SERVICETERM is defective, no error message will be displayed on the screen.

In case of the error message

`FAILURE : RAM`

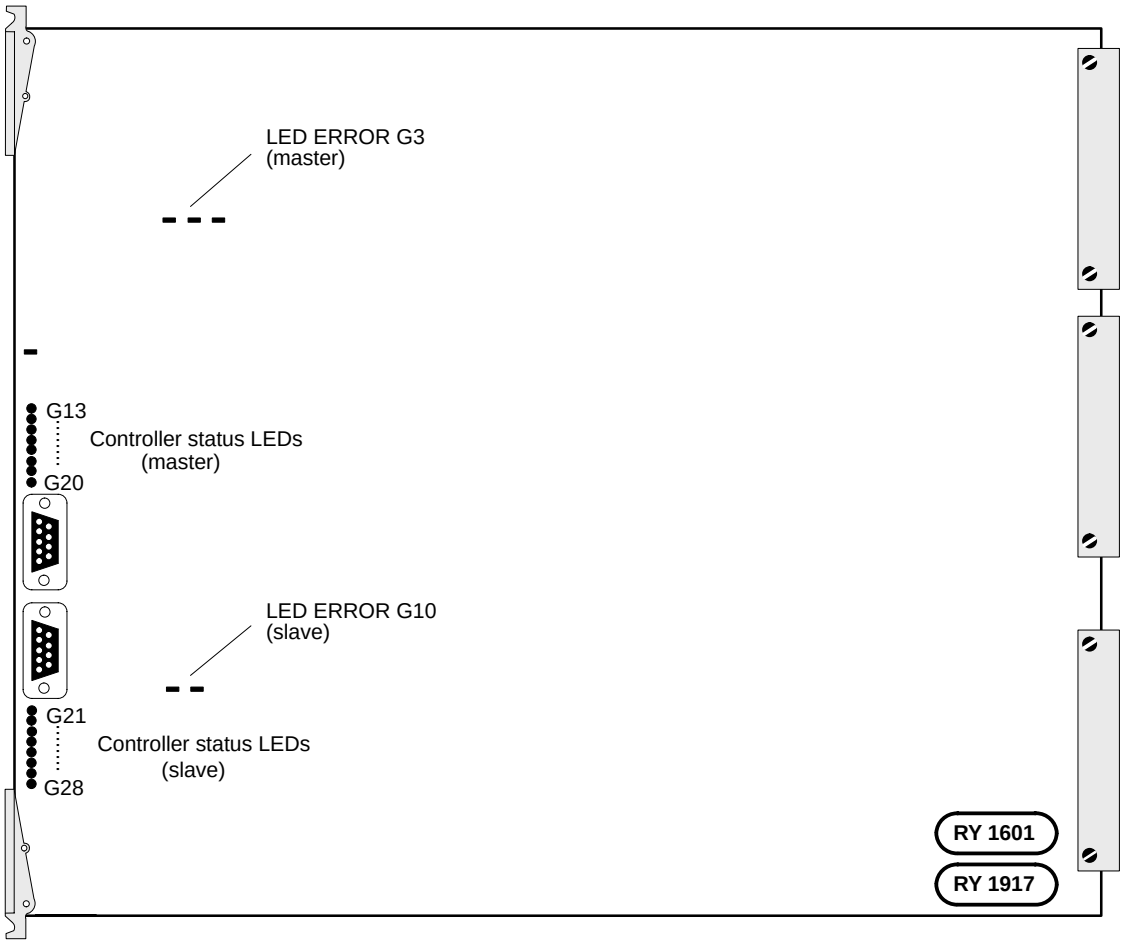
the address (segment : offset) where the error has been stated, is additionally indicated.

Service terminal Service menu

3. Error indication is made by an external service terminal via the Service menu (see section 4.2 Service Menu).

   The errors are assigned to the following EPROM event numbers:

   50 : DUART 1
   51 : INT 3
   52 : EPROM
   53 : RAM
   54 : DUART 2
   55 : INT 2
   56 : Video hardware



Controller board RY 1601 and RY 1917

4.1.2 CONTROL PANEL RPD 5/10/20/30

In the respective control panels, a microcomputer on controller board RY 1821 performs the power-up diagnosis.

The following tests are carried out:

Checks

1. RAM test.
   The volatile user data range is checked and filled with 00.
2. DUART test.
   Internal loopback test for:
   – DUART channel A
   – DUART channel B (dervice terminal)
3. Interrupt 3.
   Interrupt of DUART 1 for the Service menu.
4. EPROM test.
   Checking the check sum of the EPROM bank.
5. Interrupt 2.
   Interrupt for the operating system.
6. Hardware – 1/0
   Keyboard hardware, not yet implemented.

Test procedure

At the beginning of the test, all LEDs of the controller status LED row on the controller board are lit. After having passed the test, the associated LED is switched off. Switching-off is made from the left to the right. This, however, is hardly perceptible when powering up, since the tests – except for the RAM and EPROM checks – are very fast.
If a certain test failed, the LED stays lit.

An exception is the right LED which indicates during normal operation the error "**NO CHEAPERNET COMMUNICATION**" in addition to the running light.

When all tests have been passed, a kind of running light appears on the LED row. This shows immediately whether the controller operates in the normal mode.
The running light, however, is operated by the microcomputer only if it has not to perform further processes.
Note:
The speed of the running light allows a qualitative judgement of the computer activity.

Running light slow = MCP heavily activated
Running light fast = MCP hardly activated

Error indication

If the power-up diagnosis finds an error, at least one of the red ERROR LED / G1 on the controller is lit.

Kind of error

In order to determine the kind of error, there are different possibilities to display the error messages.

- Via the controller status LED row on the controller board.
- Via the 4-digit LED displays on the control panel.
- Via an external service terminal (e.g. PC, VT100).
- From an external service terminal via the Service menu.
- Via the control panel display (RPD 20/30 only).

Controller status LED row

1. Error indication is made by the controller status LED row (G11...G18) on the controller board.
   If a certain test failed, the associated LED stays lighted.

   To the individual LEDs, the following errors are assigned :

LED	Error
G11	RAM
G12	Service-Term (DUART 1 Channel B)
G13	INT3
G14	EPROM
G15	DUART 1 Channel A, DUART 2 Channel A + B
G16	INT2
G17	Hardware I/O
G 18	Cheapernet – not used for power-up (master only)

LED display control panel

2. Error indication is made by all 4-digit LED displays (G11...G18) on the control panel.
   The test display will show a ***PUxy*** test. The ***xy*** is the hexadecimal encoding of the error byte whose individual bits, errors are assigned to.

   To the individual bits, the following errors are assigned :

	Bits	Error	Value Error Byte
Y	0 LSB	RAM	1
	1	Service-Term (DUART 1 Channel B)	2
	2	INT3	4
	3	EPROM	8
X	4	DUART 1 Channel A	1
	5	INT2	2
	6	Hardware I/O	4
	7 MSB	Cheapernet – not used for power-up (master only)	8

Y = 1st error byte
X = 2nd error byte

Evaluation table:

Num. val.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hex code	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

1st example: INT3 error display: PU04

2nd example: INT3 + service term error display: PU06

3rd example: INT3 + EPROM + Hardware display: PU4C

At the beginning of the test, all bits used are set. After having passed the test, the associated bit is set to 0 and the error byte is indicated anew. When running without finding an error, the display shows successively:

PU7F
PU7E
PU7C
PU78
PU70
PU60
PU40
PU00

This, however, is hardly perceptible when powering up, since the tests – except for the RAM and EPROM checks – are very fast.

If a certain test failed, the bit remains set and at the end not PU00 will be displayed but another information which shows the error bits.

If the DUART 1 is not inserted, the error bits 1, 2, 4 and 5 remain set. This is indicated as PU36.

When all tests have been passed, a kind of running light appears on the LED row. Same signification as for the E-box.

Service terminal

3. The error indication is made by an external service terminal.

The error is displayed on the screen as follows:

`FAILURE : xxxxx`

Note:

When SERVICETERM is defective, no error message will be displayed on the screen.

Service terminal Service menu

4. Error indication is made by an external service terminal via the Service menu (see section 4.2 Service Menu).

The errors are assigned to the following EPROM event numbers:

50 : DUART 1
51 : INT 2
52 : EPROM
53 : RAM
55 : INT 2
56 : Hardware I/O

4.2 SERVICE MENU

4.2.1 CONNECTING A PERSONAL COMPUTER OR A DATA TERMINAL

The switcher software includes a service part which enables testing the technical functionality of control panel or electronics box.

Depending on the local facilities, a PC or a terminal (e.g. VT-100) can be connected to the RS-232C interface at the respective connector panel of the device (E-box or panel) or directly on the respective controller board for calling the Service menu.

ATTENTION!

The two service interfaces at controller and connector panel are connected in parallel and must not be connected with a PC and/or terminal at the same time! The service interface at the control panel can also be used for connecting a mouse. For this purpose, the interface has to be configurated accordingly. See the Installation Manual.

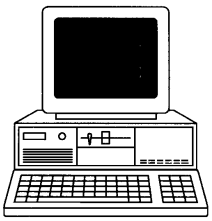
Cabling

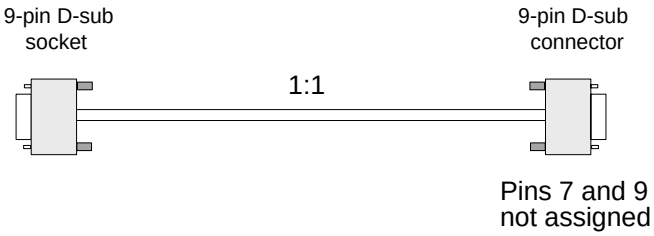
Cabling between the switcher components and the test terminal depends on the respective terminal/PC. Principally, all PCs (XT, AT, PS/2) or terminals can be connected. The differentiation refers to the respective connector socket and the pin assignment.
The pins 7 and 9 of the connection cable must not be connected with the PC/terminal. In dependence on the logic level, this might lead to a permanent reset or to the start of the monitor program.
The two terminal sockets on the controller RY1821 / RY1822 or on the connector panel must not be connected with PCs and/or terminals at the same time.

Data transmission operates with the following parameters:

9600 Baud, 8 Bit, No Parity, 1 Stopbit.

PC AT

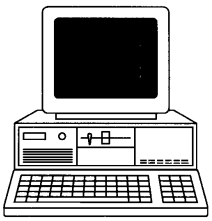


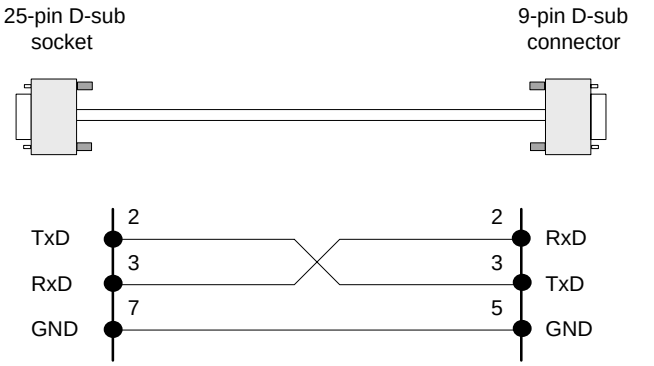


Diamond digital
E-box controller or
E-box connector pan.

Panel controller or
Panel connector pan.

PC XT or PS/2

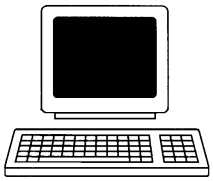


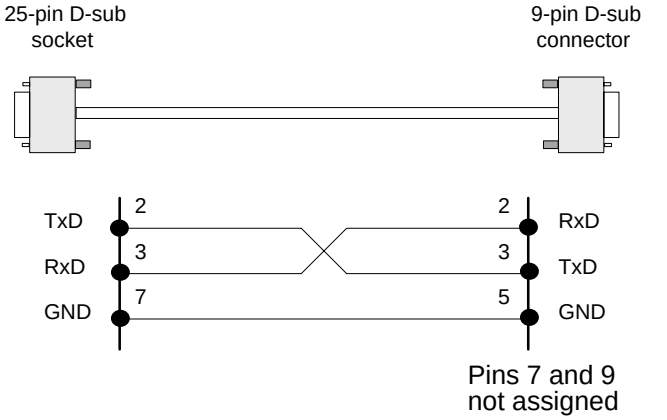


Diamond digital
E-box controller or
E-box connector pan.

Panel controller or
Panel connector pan.

Terminal VT-100





Diamond digital
E-box controller or
E-box connector pan.

Panel controller or
Panel connector pan.

4.2.2 SERVICE MENU CONTROL PANEL

After having connected a PC to the corresponding service interface of the switcher, call a terminal emulation program (e.g. KERMIT) and establish the connection (for KERMIT by "**C**" = connect) to the switcher processor.

The terminal emulation program KERMIT is part of the disk and included in the delivery. The disk also contains the respectively current software version.

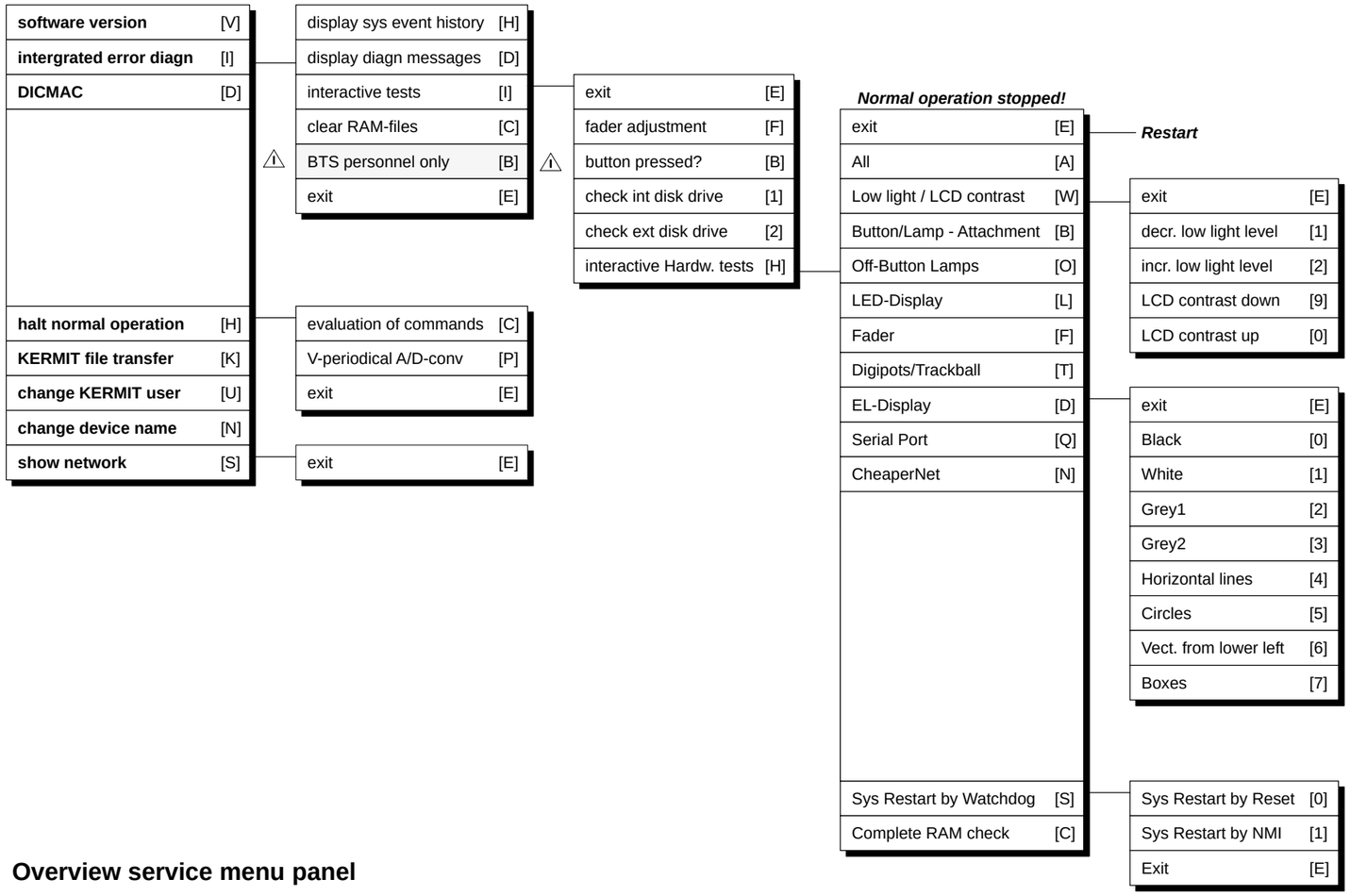
Main menu

The screen displays the **Main menu**. The display depends on the respective switcher type. The display below shows an example with switcher DD20.

```
D20   Service Menu
------------------------------------------------

device: D20-PAN
user: COMMON
software version                              [V]
integrated error diagnosis                    [I]
DICMAC direct control and memory access       [D]
halt normal operation                         [H]
KERMIT file transfer                          [K]
change KERMIT user                            [U]
change device name                            [N]
show network                                  [S]
```

The individual functions of the selection menu can be started by pressing the corresponding key of the PC.

The menu can be exited by **E**(xit). For most of the keyboards, the menu can be also be exited with **Rubout** or **Del.**



Overview service menu panel

Software version

Pressing the **"V"** key displays the software version of the control panel:

```
device type                 d20 panel
eprom sw–version            D25BPP_P38–PR752D
creation date               3-MAY-1995 10:48:50.60
flash sw–version            XF85P38–DS0011K–Test
creation date               26JUL-1995 12:26:22.51
DIP T8 RY1821 1..8          00101000
LCK–MONITOR version         41
MOPS system version         15
MOPS user version           5

press RETURN key to continue ...
```

The first five lines show the current software state. When inquiring the **Philips** service, this information should be always indicated.
Line 6 shows the current position of the DIL switch on the controller. Compare the display with the indications in the Installation Manual.

Integrated error diagnosis

Pressing the **"I" key** calls a submenu for the integrated error diagnosis:

```
Integrated Error Diagnosis
--------------------------------------------------
display system event history              [H]
display diagnostic messages               [D]
interactive tests                         [I]
clear RAM–files                           [C]
Philips personnel only                    [B]
exit                                      [E]
```

Further information is contained in the section "Integrated Error Diagnosis" on page 4-17.

DICMAC direct control and memory access

Pressing the **"D"** key calls the DICMAC.
This menu function is determined for **Philips** service and **Philips**-internal application.
This Service Manual does not describe the function in details.
You receive detailed information in the maintenance training of the manufacturer.

ATTENTION!

Wrong entries can cause malfunctions, data losses and even a complete failure of the device.

```
HELP   BASE   DISPLAY   MODIFY   SEGMENT
INPUT   OUTPUT   GET   PUT
MACRO   LEARN   REPEAT   EXIT
```

Halt normal operation

Pressing the **"H"** key enables halting some periodic system procedures in a submenu and starting them again.

Example:

```
evaluation of commands                [C]
V-periodical A/D-conversion           [P]
exit                                  [E]
```

Entering "**C**" halts the evaluation of control commands.

```
evaluation of commands                [C] (halted)
V-periodical A/D-conversion           [P]
exit                                  [E]
```

Entering "**C**" switches back to normal operation.

```
evaluation of commands                [C]
V-periodical A/D-conversion           [P]
exit                                  [E]
```

KERMIT file transfer

Pressing the **"K"** key calls the KERMIT panel to store, for instance, files from the panel on a disk.

```
PAN–Kermit>DIR

Directory : D20–PAN / COMMON  ( # means shared file )

ASSIGN    #CONF-PA  #MACRO-PA  #DDBPF
#MENU-FX  #MENU-LJ  #SEL-EBOX  STATE-PA
#ALL-PA

PAN-Kermit>QUIT
```

Excecution of these activities requires detailed knowledge of the PC-DOS operating system and the data communication program KERMIT.

This function enables a data backup on a disk.

Pressing the "**?**" <return> key displays an explanation of the commands from PAN-Kermit. The "**DIR**" command indicates the files.
Entering QUIT oe EXIT returns the user to the service menu.

Change KERMIT user

Pressing the **"U"** key enables changing the KERMIT user.

```
D5 Service Menu
------------------------------------------------
device: STUDIO 1
user: COMMON    (current user)

software version                          [V]
integrated error diagnosis                [I]
DICMAC direct control and memory access   [D]
halt normal operation                     [H]
KERMIT file transfer                      [K]
change KERMIT user                        [U]
change device name                        [N]
show network                              [S]
```

Change device name

Pressing the **"N"** key enables changing or determining the name of the switcher control panel. This is especially useful when several switchers communicate with each other in one network.

```
enter new device name:
```

The device name can comprise 10 charactes at maximum. Entry is terminated with the RETURN key.

Show network

Pressing the **"S"** key shows all units connected to the switcher network.

```
select electronic box; connected devices:

D30–      (d30 panel         00 80 CE 03 06 01 )     [1]
D20–BOX   (d30 electronics   00 80 CE 03 06 04 )  >  [4]
D20–PAN   (d20 panel         00 80 CE 03 06 05 )  *  [5]
D10–PROJ  (d10 panel         00 80 CE 03 06 09 )     [9]
D20M–PAN  (dd20m panel       00 80 CE 03 06 14 )     [20]
D10M      (dd20m electronics 00 80 CE 03 06 15 )     [21]

exit                                                 [E]
```

The current devices are marked by

"*****" (this device) and
">" (communication partner) .

Integrated Error Diagnosis

Selecting the menu function ”Integrated error diagnosis” (with key **”I”**) in the main menu calls a submenu which enables selection of the individual diagnostic possibilities.
The individual functions of the Selection menu can be initiated by pressing the corresponding key of the PC.

```
Integrated Error Diagnosis
-----------------------------------------------
display system event history                [H]
display diagnostic messages                 [D]
interactive tests                           [I]
clear RAM–files                             [C]
Philips personnel only                      [B]
exit                                        [E]
```

Display system event history

Pressing the ”**H**” key calls the system event history.

```
High scores since: 07-NOV-95 10:05:15
Pattern_timer           :    1
scan_keyb fail          :    1
butt 361 fail           :    1
butt 361 count          :    0

Press SPACE to continue..

System Events
encountered since: 07-NOV-95 10:05:15 = 0

Press SPACE to continue..


Clear System Event history (Y/N) ?
```

For clearing the list, enter Y (shift). The system event list gathers events which have to be recorded, but do not have the character of an ”error event”.

Display diagnostic messages

Pressing the **"D"** key displays internally stored error messages of the control panel. The error states and error events are provided with numbers. The complete list of the error messages is at the end of the chapter.

Example:

```
last reset          :hardware
watchdog events     :0 / 1 / 26
fields per second   :50

system and communication (#) errors encountered :
  B2.07.9E
  #LAN..09
  RES-WDOG (last event)

actual error states:
  017 / power supply I
  018 / power supply II

error events occured:
  056 / I/O to boards


press RETURN key to continue
```

Clear RAM files

This menu function is determined for **Philips** service only!
You receive detailed information in the maintenance training of the manufacturer.
Pressing the **"C"** key**,** deletes the contents of the RAM stores. Previously, a backup of all user data has to be performed! For the standard initialization, all user data will be set to zero.
Prior to deleting, the following prompt will be displayed:

```
do you really want to lose memory contents
( ALL / Query / No )
```

For ALL, enter also "**A**" "**L**" "**L**".

ATTENTION!

***Wrong entries can cause malfunctions, data losses and option loss*.**

Philips personnel only

Pressing the **"B"** key calls a menu function which is reserved for the Philips service technicians.
Please do not perform here any adjustment!
You receive detailed information in the maintenance training of the manufacturer.

ATTENTION!

Wrong entries can cause malfunctions, data losses and even complete failure of the device.

```
enable system error output                [Y]
cheapernet interface monitor              [I]
serial port                               [S]
automatics                                [A]
change cheapernet address                 [C]
display stack usage                       [U]
load program code                         [P]
TFTP filetransfer                         [F] enabled
file transfer                             [B]
permanent file check                      [K] disabled
display menu boX params                   [X]
display menu baR params                   [R]
display menu icOn params                  [O]
display Menu softkey params               [M]
exit                                      [E]
```

Interactive tests

Pressing the **"I"** key calls a submenu which enables calling several hardware test menus.

```
Exit                                    [E]
fader adjustment                        [F]
Button pressed ?                        [B]
check internal disk drive               [1]
check external disk drive               [2]
interactive hardware tests              [H]
```

Exit

Pressing the **"E"** key exits the menu.

Fader adjustment

```
Fader adjustment
-------------------------------------------------
Exit                                    [E]
UPPER adjust                            [U]
LOWER adjust                            [L]
```

Button pressed

```
Button no: (hex) (FFFF= exit):FFFF
```

Check disk drive

```
Exit                                    [E]
fader adjustment                        [F]
Button pressed ?                        [B]
check internal disk drive               [1]
check external disk drive               [2]
interactive hardware tests              [H]

check internal drive
insert 1.44MB formated disk and press any button!

disk changed
DISK CONNECTION OK!
```

Interactive hardware tests

Pressing the **"H"** key calls a submenu which enables starting individual hardware tests.

```
Diagnostics enabled. Normal Operation stopped.
When diagnostics are finished,
system will be restarted by Software-Reset.


Control Panel Interactive Tests
Version  2.10 last revision: 28-FEB-1992 09:09:17.95

Exit ( by Software Reset )                [E]
All                                       [A]
Low–Light / LCD–Contrast                  [W]
Button/Lamp – Attachment                  [B]
Off–Button Lamps                          [O]
LED–Display                               [L]
Fader                                     [F]
Digipots/Trackball                        [T]
EL–Display                                [D]
Serial Port                               [Q]
CheaperNet                                [N]
Power–Up Selftest                         [P]
System Restart by WATCHDOG                [S]
Complete RAM check                        [C]

Which built–in diagnostics do you wish to run *
```

Exit

Pressing the **"E"** key exits the menu.

All

Pressing the **"A"** key directly excecutes successively all displayed tests except for the two last ones.

Low-Light/ LCD Contrast

Pressing the **"W"** key calls a test which indicates the low-light level of the key lamps which can be adjusted in 16 steps. This test can also be used to check whether all LEDs in the keys will light.

```
Low–Light / LCD–Contrast

Press SPACE to exit or proceed this diagnostic.

Exit                                          [E]
decrease low light level                      [1]
increase low light level                      [2]
LCD–Contrast  Low–Light–Level
08  08
08  08
```

Button/Lamp Attachment

Pressing the **"B"** key calls a test which enables testing the individual key functions with associated lamp indicator.
If a key on the control panel is pressed, the built-in LED will light. The terminal indicates the logic key number of the key pressed last as long as it is pressed.

Practical application: Ascertaining whether the keystroke is noticed.
Ascertaining whether the LED is controlled.
The pulse at the SWTP measuring point can be used for triggering an oscilloscope.

```
Button/Lamp – Attachment

Press SPACE to exit or proceed this diagnostic.

Press a button on the control panel
and the built–in lamp will turn on.
Button :
0361
```

Off-Button Lamps

Pressing the **"O"** key calls a test which enables checking the LED displays not assigned to any keys.

- ON-AIR. The red LED beside the crossbar keys.
- KEY 1, ON, OVER, etc.
- DELEGATION.
- DIRECTION-FADER.

The LEDs can be switched on and off with the keys being lighted with this text. The terminal shows the logic number of the associated LED.

Practical application: Ascertaining whether the mentioned LEDs are controlled.

```
Off–Button Lamps

Press SPACE to exit or proceed this diagnostic.

Press a delegation button on the control panel
and the lamp below the button will turn on.
Press the rightmost button on the BGD or PST rows
and the GREEN lamp for the row will turn on.
Press the button left to the rightmost button on the BGD
or PST rows and the RED lamp for the row will turn on.
Press the lowest or top button of the button column near
the fader and the down or up arrow lamp will turn on.

Button Lamp

0187 017F
```

LED Display

Pressing the **"L"** key calls a test which enables checking the functions of the four-digit LED displays (e.g. via the source keys).

This test comprises two parts.

In the first part, the pixel segments of the LED displays are checked.

For this purpose, the following patterns

"####"
"HHHH"
"TTTT"
"**"**

are successively written into all LEDs.

At the beginning of the test, the LED displays are blank. For changing the pattern, press the space bar at the terminal. At the end, the displays are blank.

In the second part, *<CU" is written into an LED display when the key below is pressed.
The terminal shows the logic number of the key pressed last and the number of the associated LED display.

Practical application: Ascertaining whether the LEDs can be controlled and are ok.

```
LED-Display

Press SPACE to exit or proceed this diagnostic.

Pixel-Test: Now all LED-Displays should be blank.
Press SPACE and all LED-Displays will show ####
Pixel-Test: Now all LED-Displays should display #### .
Press SPACE and all LED-Displays will show HHHH
Pixel-Test: Now all LED-Displays should display HHHH .
Press SPACE and all LED-Displays will show TTTT
Pixel-Test: Now all LED-Displays should display TTTT .
Press SPACE and all LED-Displays will show ****
Pixel-Test: Now all LED-Displays should display **** .
Press SPACE and all LED-Displays will be blank
Press a button on the control panel NEAR a LED-Display
and *<CU will appear in this display.

Button LED
0361
```

Fader

Pressing the **"F"** key calls a test which enables checking the faders of the control panel.

```
Fader

Press SPACE to exit or proceed this diagnostic.

Return value of initialization : 00
Actual fader values : ( to increase turn Up or /Right )
ME1   ME2   PP    EXTRA
0F81  0004  0826  0386
```

When calling, first the 12-bit data aquisition system (LM12458) is initialized. The return value (error code) reveals possible hardware problems.

Meaning of the error code:

00H:	OK (no error occurred)	
01H:	Register-verify failed	(hardware error)
02H:	Self1-calibration timed-out	(hardware error)
03H:	Sequencer not ready	(hardware or software error)
04H:	Fifo-data inconsistent	(hardware or software error)

If an error code has to be indicated, it is recommendable to exchange the controller board.

At the end of this test, the periodic conversion of four fader channels will be started. The display on the terminal will be periodically updated.

ATTENTION!

The final values 000H and FFFH are not obtained in any case, since the fader path is mechanically limited to approx. 90 degrees, however, with the employed potentiometers approx. 100 degrees are electrically possible. This discrepancy is compensated by the software.
The final values, however, must be <200H or >E00H.

Practical application:
- Ascertaining whether the A/D converter operates correctly.
- Ascertaining whether the cabling is correct.
- Ascertaining whether the position of the DIP switches T1 on RC 1855 is correct.
- Ascertaining the stability of the converter values (+/- 1 LSB is always occurring).

If the limit position of the fader does not effect a switchover, a re-adjustment of the fader might be required.

Digipots / Trackball

Pressing the "**T**" key calls a test which enables checking the analog controls and the trackball (if available) of the control panel.

```
Digipots/Trackball

Press SPACE to exit or proceed this diagnostic.

Return value of initialization : 00
Akkumulated value ( turn right or up to increase )
Digipot Value
Ball-H 0000  Ball-V 0002
```

When calling, the presence of all analog controls and the trackball (or their decoder components HCTL2000) will be checked. The return value **00** says that no error has occurred, i.e. all decoders expected in this device type (DD5, DD10, ...) have also been found. The initialization value **FF** says that at least one decoder is defective or not addressable.

This part of the test covers only the decoders, not the analog controls and the trackball themselves!

After this test, the cyclical inquiry of all controls is started.

Actuating a digipot or trackball shows the logic number together with an accumulated value on the terminal. Turning in cw direction or upwards effects incrementing, turning in ccw direction or downwards effects decrementing.

Practical application: Ascertaining whether the digipot operates.
Ascertaining whether addressing is correct.

EL Display

Pressing the **"T"** key calls a test which enables checking the function of the EL display (DD20 and DD30 only), or for the switcher types DD5 and DD10 the function of a connected EGA monitor.

```
EL-Display

Press SPACE to exit or proceed this diagnostic.

Exit or select pattern to be drawn:        [E]
Black                                      [0]
White                                      [1]
Grey1                                      [2]
Grey2                                      [3]
Horizontal lines                           [4]
Circles                                    [5]
Vectors from lower left                    [6]
Boxes                                      [7]
*
```

It is possible to generate different patterns on the EL display:

Black	Display is black.
White	Display is light.
Grey 1	Display is medium light, since alternatingly one pixel lights and one pixel does not light.
Grey 2	Display is medium light, since alternatingly one pixel lights and one pixel does not light.
Horizontal Lines	Display is medium light, since alternatingly one line lights and one line does not light.
Circles	Concentric circles around the center of the display cause a characteristic alias pattern.
Vectors from lower left	Straight lines from the lower left corner to the right edge. The uppermost line goes to the upper right corner. Above this diagonal, the display is dark. In the lower part, there is a wash effect from light to medium light with typical noise structure.
Boxes	Interlaced rectangles which, beginning at bottom left, are getting larger and larger. Each rectangle is larger than the inner one and that by two pixels in the height and six pixels in the width.

When selecting this test, first the pattern "Circles" is displayed.
If the display controller cannot be addressed by the main controller, a corresponding message is passed to the terminal.

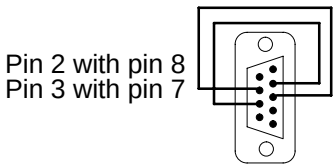
Practical application: Test of display controller, frame store and display.

Serial Port

Pressing the **"Q"** key calls a test which enables checking the function of the SERIAL PORT (RS-422) at the connector panel of the control panel.

```
Serial Port

Press SPACE to exit or proceed this diagnostic.


Press SPACE to proceed

Sending U on Port 01 Configured as Bus–Controller
character count
  not   P01   P01   P01
  sent  sent  rcvd  erro  unex
  00    00    00    00    00    OK


Press SPACE to proceed

Sending U on Port 01 Configured as Tributary
character count
  not   P01   P01   P01
  sent  sent  rcvd  erro  unex
  00    00    00    00    00    OK
  01    01    00    00    00F   FAIL
```

This test requires a test adapter (9-pin sub-D connector) having the following pins connected:



Plug the short-circuit connector onto the RS-422 interface "Serial Port" and start the test. In an interval of approx. 0.1 s, the following will happen:

Character "U" is sent once with **enabled** bus driver and "sent" is increased by "1". Then is checked whether the character has been received correctly.

If the character was

- not received: no increase at the respective port.
- received: "rcvd" is increased by "1" at the respective port.
- incorrectly received: "erro" is increased by "1" at the respective port.

Character "U" is sent once with **disabled** bus driver and "not sent" is increased by "1". Then is checked whether the character has been received correctly.

If the character was

- not received: no increase at the respective port.
- received: "unex" is increased by "1" at the respective port.
- incorrectly received: "erro" is increased by "1" at the respective port.

The terminal displays the following message:

```
Sending U on PORT 1 configured as Bus-Controller
character count.
```

not		P01	P01	P01
sent	sent	rcvd	erro	unex
00	00	00	00	00

CheaperNet

Pressing the **"N" key** calls a test which enables checking the function of the cheapernet.

```
CheaperNet

Press SPACE to exit or proceed this diagnostic.

Repeating Initialization of CHEAPERNET-Interface.
OK
```

If an error occurs, **FAIL** will be displayed instead of **OK.**

Initialization of the cheapernet interface is periodically perfomed and indicated whether it has been successful or not. During this procedure, signals can be displayed on an oscilloscope and voltages can be measured.

Display in case of an error:

FAIL..S Short on cable

FAIL..O Open on cable ⇒ no termination

FAILNoC No cable connected

For the following errors, the controller should be exchanged:

FAIL..X Transceiver problem (voltage ?)

FAILext External loopback fail

FAILECB External loopback fail + No Cable ⇒ cable or termination is missing

FAILEFR Ext loop fail + corrupted frame rcvd ⇒ short-circuit on external main line

FAILwCA Wait after CA expir. +++ ⇒ data transfer between main processor and LAN controller is disturbed.

FAILINT Data transfer operates correcty, but interrupt is disturbed

FAIL??? Error combination not known till now

In case of a cheapernet error, you can check whether it is a hardware error or a cable fault.
For this purpose, first remove the cabling and terminate **both** connector sockets with a 50-ohm terminating plug.
If the error is still indicated, it is an internal hardware error. If not, try to find the fault in the cabling.

Power-up Selftest

Pressing the **P”** key performs a power-up selftest. See section 4.1 ”Power-up Diagnosis”.

```
Power-Up Selftest

Press SPACE to exit or proceed this diagnostic.

OK     : RAM
OK     : DUART 1Channel B
OK     : INT 3
OK     : BOOT-EPROMPR 752 correct chksum= 8003
OK     : DUART 1 Channel A
OK     : INT 2
OK     : Digipot Decoder
```

If a test failed, the following message will be displayed on the connected service terminal:

FAILURE : xxxxx

Exeption: ”**FAILURE: SERVICETERM**” cannot be displayed.
If SERVICETERM is defective, other messages cannot be displayed either.

With error message ”**FAILURE: RAM**”, the address (segment : offset), at which the error has been stated, is additionally displayed.

System Restart by Watchdog

Pressing the **"S"** key opens a watchdog reset menu in order to check the function of the two built-in watchdogs.

```
System Restart by WATCHDOG

Press SPACE to exit or proceed this diagnostic.

ATTENTION ! ATTENTION ! ATTENTION !

System Restart by RESET-WATCHDOG          [0]
System Restart by MNI-WATCHDOG            [1]
Exit                                      [E]

System should be restarted within 5 seconds.
Otherwise push the RESET–Button on Processor–Board.
```

RESET-Watchdog: Initiates the reset watchdog in the deadman detector MAX 691. The reset watchdog starts the system anew with a real hardware reset.

NMI-Watchdog: Initiates a software watchdog operating with a counter in the DUART. The software watchdog causes a non-markable interrupt (NMI). In the MNI service routine, the system restart is carried out by the software.

After reset, the main menu is called by the new initialization.

Complete RAM check

Pressing the **"C"** key performs a RAM check.

```
Complete RAM check

Press SPACE to exit or proceed this diagnostic.

WARNING ! WARNING ! WARNING !

This Diagnostic will destroy all non-volatile RAM-Files.
If you want to keep them for later use, use KERMIT to
save them on a PC or save them on RAM-Card.
Do you really want to do this RAM-Check now [Y/N] ?
```

The test performs a RAM check over the complete RAM except for the operating system RAM.
As soon as an error is detected, the address is displayed and the test is terminated. The contents of the RAM cannot be used any longer after the test. If no error has been detected, the RAM is filled with 00.

ATTENTION!

This test distroys the non-volatile RAM files. Previously make a backup for all user dates!
After the RAM check, perform RAM clear.

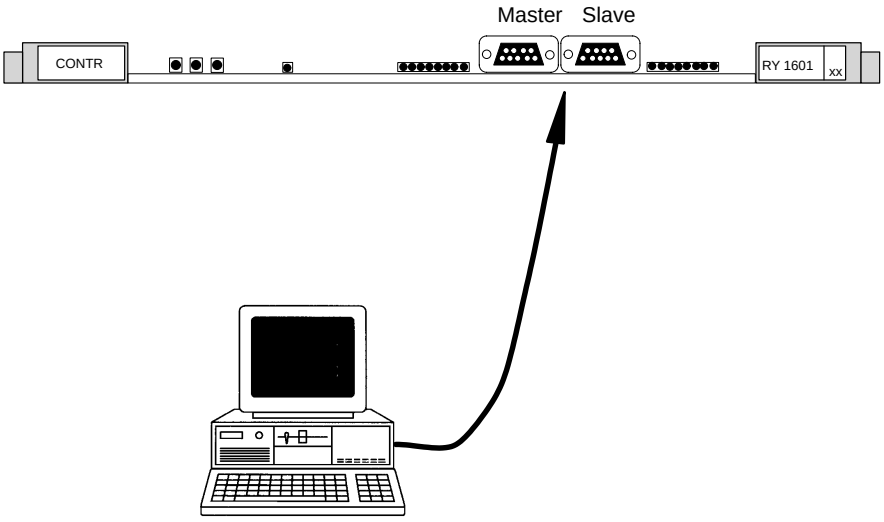
4.2.3 SERVICE MENU E-BOX

The electronics boxes of the switcher family include the controller boards RY 1601 or RY 1917. The p.c. boards contain two independent microcomputers (master and slave). Both dispose of an own service menu.
For connecting the terminal, two sockets are provided on the controller board.

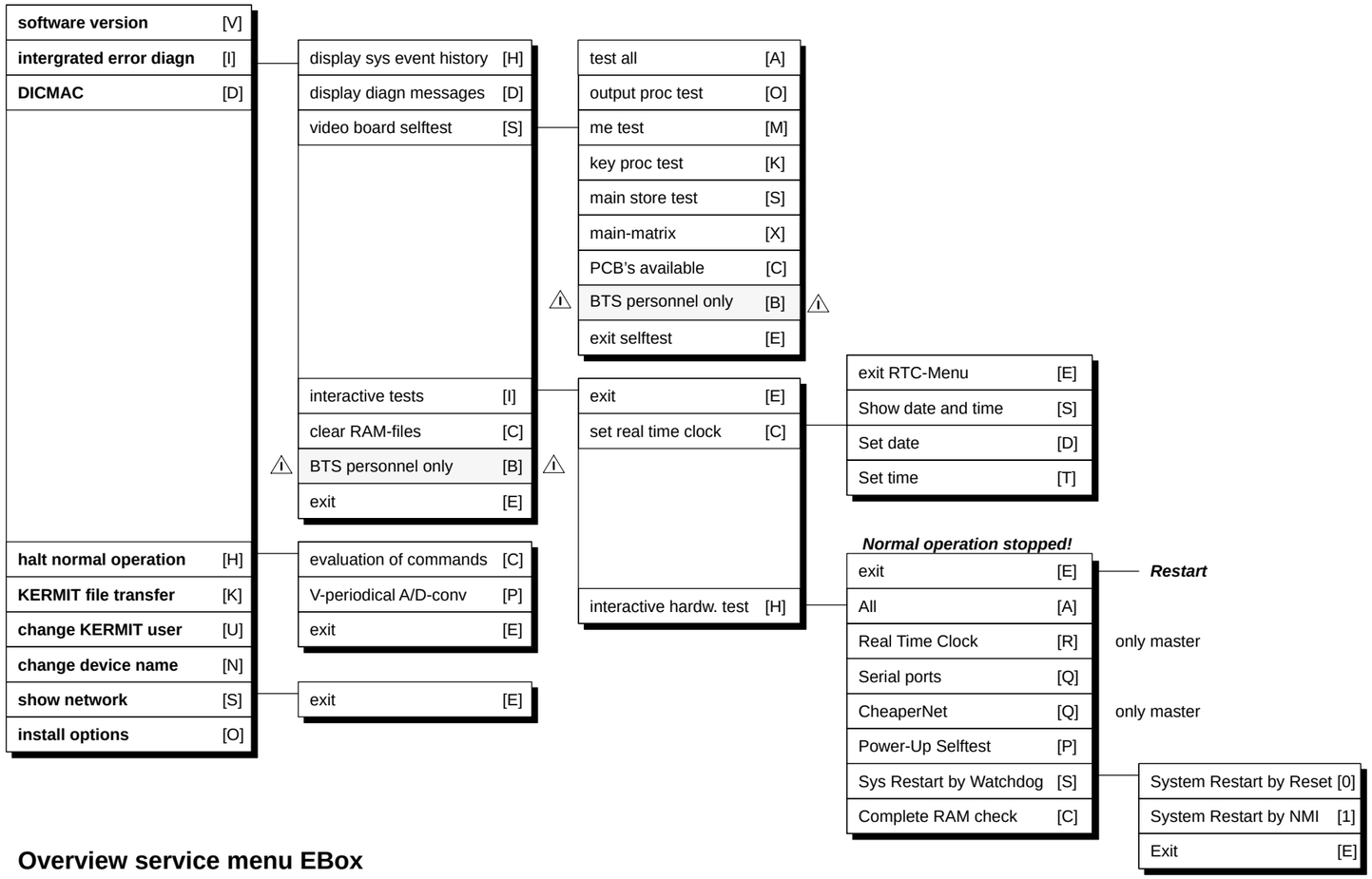
ATTENTION!

The two service interfaces (master) at controller and connector panel are connected in parallel and must not be connected with a PC and/or terminal at the same time!

The following text descibes only the service menu of the master processor. The service menu of the slave processor is made up identically. In addition, the serial interfaces of the E-box are tested in the slave menu. See the section ”Serial Ports”, page 4-55.



After having connected the PC to the corresponding service interface of the switcher electronics, call a terminal emulation program (e.g. KERMIT) and establish the connection (for KERMIT by ”**C**” = connect) to the switcher processor.
Pressing the space bar displays the service menu on the screen.



Overview service menu EBox

Main Menu

The screen displays the **Main menu**. The display depends on the respective switcher component. Below, an example with switcher DD30.

```
D30 Service Menu  (MASTER)  Ser. Nr.: 100
-----------------------------------------------
device: D30-BOX
user:  COMMON

software version                            [V]
integrated error diagnosis                  [I]
DICMAC direct control and memory access     [D]
halt normal operation                       [H]
KERMIT file transfer                        [K]
change KERMIT user                          [U]
change device name                          [N]
show network                                [S]
install options                             [O]
```

The individual functions of the Selection menu can be initiated by pressing the corresponding key of the PC.

Software version

Pressing the **”V” key** displays the software version of the E-box:

```
device type             d30 electronics
eprom sw-version        RY1601_P70-PR695C
creation date           28-APR-1995 15:45:23.05
flash sw-version        XM34P70-DS0011K+Test
creation date           3-JUL-1995 13:31:55.21
slave sw-version        S01P70-DS0011K
creation date           19-JUN-1995 15:13:32.60
DIP T77 RY1601          1..8  00001000
LCK-MONITOR version     41
MOPS system version     15
MOPS user version       5
DSP1 interrupt adr.     3580:0C68
serial number           100
option ID number :      2585233503
options installed       ME1 ChrKey
                        ME2 ChrKey
                        PP  ChrKey
                        ME1 PVW/LAYER
                        ME2 PVW/LAYER
                        PP  PVW/LAYER
                        Frame Grabber
                        Texture Store
press RETURN key to continue ...
```

The first five lines show the current software state. When inquiring the **Philips** service, this information should be always indicated.
Line 6 shows the current position of the DIL switch of the controller. Compare the display with the indications in the Installation Manual. The lines ”serial number” and ”Option ID number” are of special importance. If not already available, ”Option ID” should be noted on a sticker and fastensd at the inside of the EBox door.

Intregated error diagnosis

Pressing the **"I"** key calls a submenu for the integrated error diagnosis:

```
Integrated Error Diagnosis
-------------------------------------------------
display system event history                [H]
display diagnostic messages                 [D]
video board selftest                        [S]
interactive tests                           [I]
clear RAM-files                             [C]
Philips personnel only                      [B]
exit                                        [E]
```

Further information is contained in the section "Integrated Error Diagnosis" on page 4-40.

DICMAC direct control and memory access

Pressing the **"D"** key calls the DICMAC.
This menu function is designed for Philips service and Philips-internal application.
This Service Manual does not describe the function in details.
You receive detailed information in the maintenance training of the manufacturer.

ATTENTION!

Wrong entries can cause malfunctions, data losses and even a complete failure of the device.

```
HELP  DISPLAY  MODIFY  SEGMENT

INPUT  OUTPUT  GET  PUT  CROSSBAR

MACRO  LEARN  REPEAT  EXIT
```

Halt normal operation

Pressing the **"H"** key enables halting some periodic system procedures in a submenu and starting them again.

Example:

```
evaluation of commands                    [C]
V-periodical I/O                          [P]
evaluation of GPI / Tally / Nonsync       [N]
exit                                      [E]

evaluation of commands                    [C] (halted)
V-periodical I/O                          [P]
evaluation of GPI / Tally / Nonsync       [N]
exit                                      [E]
```

KERMIT file transfer

Pressing the **"K"** key calls the E-box KERMIT for copying files from the E-box on a disk.

```
BOX–Kermit>DIR

Directory : D20–BOX / COMMON  ( # means shared file )

  #ACCESS    #CONF-EB   #COUPLE   #EXTR-ALL
  IDENT      #MACRO-EB  #DDEBM    #DDEBS
  #MATR-TVS  PATT-USR   STATE-EB  #TEXTURES
  #ALL-EB
```

Performing these activities requires detailed knowledges of the PC-DOS operating system and the data communication program KERMIT.

This function enables a data backup on a disk.

Pressing the " **?** "<return> key explains the commands of BOX-Kermit. The command "**DIR**" indicates the files.
Entering "**QUIT**" returns the user to the service menu.

Change KERMIT user

Pressing the **"U"** key enables changing the KERMIT user.

```
device: D20-BOX
user:   COMMON

software version                          [V]
integrated error diagnosis                [I]
DICMAC direct control and memory access   [D]
halt normal operation                     [H]
KERMIT file transfer                      [K]
change KERMIT user                        [U]
change device name                        [N]
show network                              [S]
install options                           [O]
```

Change device name

Pressing the **"N"** key enables changing or determining the name of the switcher panel or renaming it. This is especially useful when several switchers communicate with each other in one network.

```
enter new device name:
```

The device name can consist of 10 characters at maximum. Entry has to be terminated with the RETURN key.

Show network

Pressing the **"S"** key shows all units connected to the switcher network.

connected devices:

```
D10-PAN   (d10 panel          00 80 CE 03 06 00 )    [0]
D30-BOX   (d30 electronics    00 80 CE 03 06 01 ) *  [1]
D20-PAN   (d20 panel          00 80 CE 03 06 02 ) >  [2]
D10-PROJ  (d10 electronic     00 80 CE 03 06 04 )    [4]
D30-PROJ  (d30 panel          00 80 CE 03 06 05 ) >  [5]
D10-PAN   (d10 panel          00 80 CE 03 06 06 )    [6]
D10-DAL   (d10 electronics    00 80 CE 03 06 07 )    [7]
D10-PROJ  (d10 panel          00 80 CE 03 06 09 )    [9]
D20M-PAN  (dd20m panel        00 80 CE 03 06 14 )    [20]
D10M      (dd20m electronics  00 80 CE 03 06 15 )    [21]
SASTPAN   (dd20m panel        00 80 CE 03 06 16 )    [22]
D20M-BOX  (dd20m electronics  00 80 CE 03 06 17 )    [23]
```

The current devices are marked by

"*****" (this device) and
">" (communication partner) .

Install options

Pressing the **"O"** key enables entry of device-specific option codes. This menu function serves the manufacturer (Philips) to enter customized device configurations.

```
enter device specific option code: ?
```

Integrated Error Diagnosis E-BOX

Selecting the menu function "Integrated error diagnosis" (with the **"I"** key) in the Main menu calls a submenu which enables selection of the individual diagnostic facilities.
The individual functions of the Selection menu can be initiated by pressing the corresponding key of the PC.

```
Integrated Error Diagnosis

display system event history          [H]
display diagnostic messages           [D]
video board selftest                  [S]
interactive tests                     [I]
clear RAM-files                       [C]
Philips personnel only                [B]
```

```
exit                                    [E]
```

Display system event history

Pressing the ”**H**” key calls the sytem event history.

```
High scores since: 09–JUN–95 16:00:42
Pattern_timer : 5712
max recall dur: 43
                        Press SPACE to continue..
System Events encountered since: 09–JUN–95 16:00:42 =
488 following the last 50 entries:
24–JUN–95 13:38:46 ===> communication_off

Press SPACE to continue..

Clear System Event history   (Y/N) ?
```

For clearing the list, enter Y (shift). The system event list gathers events which have to be recorded, but do not have the character of an ”error event”.

Display diagnostic messages

Pressing the **”D” key** indicates internally stored error messages of the electronics box. The error states and error events are provided with numbers. The complete list is at the end of the chapter.

Examples:

```
last reset        : hardware
watchdog events   : 0 / 7 / 1
fields per second : 60

system and communication (#) errors encountered:
      KEYC..10
      KEYC..1
      #LAN..09
      #LAN..09
      #LAN..09
      #LAN..09
      #LAN..09
      #OverRun  (last event)

actual error states  :
      089 / + Power supply failed!
      090 / – Power supply failed!

error events occurred : none

press RETURN key to continue ...
```

```
clear system errors and watchdog events   [C]
disable error because not installed       [D]
enable single error                       [S]
enable all errors                         [A]
exit                                      [E]
```

Video board selftest

Pressing the **"S"** key enables starting the hardware test in the video electronics. For this purpose, a submenu is called which enables starting the individual tests. Further information is contained in section "Video Board Selftest" on page 4-51.

```
test all                                [A]
output proc test                        [O]
me test                                 [M]
key proc test                           [K]
main-store test                         [S]
main-matrix                             [X]
PCB's  available                        [C]
Philips personal only                   [B]
exit selftest                           [E]
```

Clear RAM files

This menu function is determined for the **Philips** service only!
Pressing the **"C"** key will **clear** the RAM memories. Previously, make a backup of all user data! For the standard initialization, the user data are set to zero.
You receive detailed information in the maintenance training of the manufacturer.

ATTENTION!

Wrong entries can cause malfunctions, data losses and option loss.

Prior to clearing, the systems will ask:

```
do you really want to lose memory contents?
(ALL/Query/No)

ACCESS                                  cleared
ASSIGN                                  cleared
CONF-EB                                 cleared
COUPLE                                  cleared
EXTR-ALL                                cleared
IDENT                                   cleared
MACRO-EB                                cleared
MATR-TVS                                cleared
PATT-USR                                cleared
STATE-EB                                cleared
TEXTURES                                cleared
SYSTEM                                  cleared

*** file SYSTEM modified: RESTART ***
```

For ALL, enter also "**A**" "**L**" "**L**".

Philips personnel only

Pressing the **"B"** key calls a menu function which is reserved for the **Philips** service technicians.
Please do not perform here any adjustments!
You receive detailed information in the maintenance training of the manufacturer.

ATTENTION!

Wrong entries can cause malfunctions, data losses and even complete failure of the device.

```
enable  system error output                [Y]
cheapernet interface monitor               [I]
EXTRA-processor                            [X]
Display ME info                            [D]
Serial Port XBAR                           [S]
automatics                                 [A]
control matrix                             [M]
change device type (until hard reset)      [T]
change cheapernet address                  [C]
display stack usage                        [U]
load program code                          [P]
TFTP filetransfer                          [F] enabled
OS-extension tests                         [O]
file transfer                              [B]
permanent file check                       [K] disabled
exit                                       [E]
```

Interactive tests

Pressing the **"I"** key calls a submenu which enables displaying a time/data setting menu or a hardware test menu.

```
Exit                                       [E]
set real time clock                        [R]
interactive Hardware tests                 [H]
```

Exit

Pressing the **"E"** key exits the menu.

Set real time clock Pressing the **"R"** key calls a submenu which enables setting time and date.

```
*********          RTC-Menu          *********

exit RTC-Menu                                [E]
Show date and time                           [S]
Set date                                     [D]
Set time                                     [T]
```

Show date and time Pressing the **"S"** key shows time and date.

```
*********          RTC-Menu          *********

Monday                    03.07.95  14:09:28
```

Set date Pressing the **"D" key** enables setting the current date. Enter the year with two digits.

```
*********          RTC-Menu          **********

Year:                                        95
Month:                                       07
Day:                                         03
```

Set time Pressing the **"T"** key enables setting the real time.

```
*********          RTC-Menu          **********

Hours:                                       07
Minutes:                                     32
Seconds:                                     53
```

Interactive hardware tests

Pressing the **"H"** key calls a submenu which enables starting individual hardware tests.

```
Diagnostics enabled. Normal Operation stopped.
When diagnostics are finished,
system will be restarted by Software–Reset.

Electronic Box Interactive Tests
Version  1.0   last revision: 15–FEB–1994 11:31:39.01

Exit ( by Software Reset )                [E]
All                                       [A]
Real Time Clock                           [R]
Serial Ports                              [Q]
CheaperNet                                [N]
Power–Up Selftest                         [P]
System Restart by WATCHDOG                [S]
Complete RAM Check                        [C]
```

Exit

Pressing the **"E"** key exits the menu.

All

Pressing the **"A"** key successively performs all indicated tests except for the two last ones.

Real time clock

Pressing the **"R"** key tests the internal real-time clock. Date and time are displayed on the terminal.

```
Real Time Clock

Press SPACE to exit or proceed this diagnostic.

Time is: TUE 12–SEP–95 09:32:44
```

Serial ports

Master: Test of interfave XBAR, test adapter is descibed in the section *Service meu control panel.*

Slave: Test of ports 1, 2, 3. See section *Test RS-422 Ports* below.

CheaperNet

Pressing the **"N"** key calls a test which enables checking the function of the cheapernet.

If an error occurs, **FAIL** will be displayed instead of **OK.**

```
CheaperNet

Press SPACE to exit or proceed this diagnostic.

Repeating Initialization of CHEAPERNET–Interface.

OK
```

Initialization of the cheapernet interface is periodically performed and indicated whether it was successful or not. During this procedure, signals can be displayed on an oscilloscope and voltages can be measured.

Display in case of an error:

FAIL..S	Short on cable
FAIL..O	Open on cable ⇒ no termination
FAILNoC	No cable connected

In case of the following errors, the controller should be changed.

FAIL..X	Transceiver problem (voltage ?)
FAILext	External loopback fail
FAILECB	External loopback fail + No Cable ⇒ cable or termination is missing
FAILEFR	Ext loop fail + corrupted frame rcvd ⇒ short-circuit on external main line
FAILwCA	Wait after CA expir. +++ ⇒ Data transfer between main processor and LAN controller is disturbed
FAILINT	Data transfer operates correctly, but interrupt is disturbed
FAIL???	Error combination unknown till now

In case of a cheapernet error, you can check whether it is a hardware error or a cable fault.
For this purpose, first remove the cabling and terminate **both** connector sockets with a 50-ohm terminating plug.
If the error is still indicated, it is a hardware error. If not, try to find the fault in the cabling.

Power-up Selftest

Pressing the **"P"** key performs a power-up selftest. See section 4.1 "Power-up Diagnosis".

```
Power–Up Selftest

Press SPACE to exit or proceed this diagnostic.

OK  : RAM
OK  : DUART 1 Channel B
OK  : INT 3
OK  : BOOT–EPROM   PR 695 correct chksum= C2E9
OK  : DUART 1 Channel A
OK  : DUART 2 Channel A and B
OK  : INT 2
OK  : Genlock.
      Run VIDEO BOARD SELFTEST for more information.
```

If a test failed, the following message will be displayed on the connected service terminal:

FAILURE : xxxxx

Exeption: "**FAILURE: SERVICETERM**" cannot be displayed.
If SERVICETERM is defective, other messages cannot be displayed either.

With error message "**FAILURE: RAM**", the address (segment : offset), at which the error has been stated, is additionally displayed.

System Restart by Watchdog

Pressing the **"S"** key performs a watchdog reset in order to check the function of the two built-in watchdogs.

```
System Restart by WATCHDOG

Press SPACE to exit or proceed this diagnostic.

ATTENTION ! ATTENTION ! ATTENTION !
System Restart by RESET–WATCHDOG          [0]
System Restart by NMI-WATCHDOG            [1]
Exit                                      [E]
```

RESET-Watchdog: Initiates the reset watchdog in the deadman detector MAX 691 which starts the system anew with a real hardware reset.

NMI-Watchdog: Initiates a software watchdog operating with a counter in the DUART which causes a non-markable interrupt (NMI). In the MNI service routine, the system restart is carried out by the software

After reset, the main menu is called by the new initialization.

Complete RAM check

Pressing the **"C"** key performs a RAM check of the master processor.

```
Complete RAM Check

Press SPACE to exit or proceed this diagnostic.

WARNING ! WARNING ! WARNING !

This Diagnostic will destroy non-volatile RAM-Files.
If you want to keep them for later use,
use KERMIT to save them on a PC or save them on Disk.

Do you really want to do this RAM-Check now [Y/N] ?
```

Performs a RAM check over the RAM of the master processor except for the operating system RAM.
As soon as an error is detected, the address is displayed and the test is terminated. The contents of the RAM cannot be used any longer after the test. If no error has been detected, the RAM is filled with 00.

ATTENTION!

This test distroys the non-volatile RAM files. Previously make a backup for all user dates!
After the RAM check, perform RAM clear and reload the USER-Data.

Video Board Selftest

The video board selftest is designed to detect defective boards in the E-boxes (RMD 5/10/20/30) and to inform the user about the current state of the E-box.
The video selftest should be performed in case of a faulty power-on diagnosis.
At present, the wipe processor in all E-boxes is exempted from the selftest, i.e. the system displays always OK.
Only internal paths can be checked, i.e. not all output lines are covered by the selftest. Input lines can be only tested when applicable (synchronous) 4:2:2 signals are present. The selftest automatically detects which inputs are connected to applicable signals.
The defective card(s) is (are) indicated to the user. This is not always possible, since for space reasons, the required test buses could not be installed at all places. Therefore it might be sometimes possible that several cards will be indicated to be defective. The call is made via the diagnosis menu. The Diagnosis menu indicates the defective card and in the E-box the green LED on the defective card is switched off. For all switchers it is possible to call the selftest via the service terminal. After having switched on power, only a short test is performed.

Pressing the **"S" key** under the menu function "Integrated error diagnosis" calls the selftest.
The displays shows the menu and a list of the available p.c. boards.
The individual functions of the Selection menu can be initiated by pressing the corresponding key of the PC.

```
D30–Box selftest Version  5.10 .

RY 1900     Version  0  3  5  found.
RY 1911     Version  0  3  0  found.
RY 1903     Version  0  3  10 found.
RY 1943     Version  2  2  1  found.
RY 1908     Version  0  3  7  found.
RY 1900_2   Version  3  5  5  found.
RY 1903_2   Version  0  3  10 found.
RY 1903_3   Version  0  3  10 found.
RY 1943_2   Version  2  2  1  found.
RY 1943_3   Version  2  2  1  found.
RY 1909_2   Version  0  1  1  found.
RY 1908_3   Version  0  3  6  found.
RY 1913     Version  0  2  0  found.
RM 1923                       found.


test all                              [A]
output proc test                      [O]
me test                               [M]
key proc test                         [K]
main-store test                       [S]
main-matrix                           [X]
PCB's available                       [C]
Philips personnel only                [B]
exit selftest                         [E]
```

Test all

Pressing the **"A"** key successively performs the tests **C**, **O**, **M**, **K**, **I** and **X**. Normally, only "Test all" should be performed and not the individual tests.

Output proc test

Pressing the **"O"** key starts a test which enables checking the comparator, Colgen1, Colgen2 and the store. When an error message is displayed, the video board selftest cannot be performed.

```
OUTPUT PROCESSOR-TEST

Comparator and Colgen1 and Colgen2 and Store ok.
```

ME test

Pressing the **"M"** key starts a test which enables testing all available ME stages (three at max.).

```
M E – P R O C 1

A–bus–test out 3–4
A–bus–opacity out 3–4
Pre matrix test, TRS on.
SPEC
DVE
BG–A
BG-APB
BG–B
BG–BPB
FILL–1
FILL–2
Pre matrix (all crosspoints), TRS off, Colgen 1
.
..
M E – P R O C 2

A–bus–test out 3–4
A–bus–opacity out 3–4
Pre matrix test, TRS on.
SPEC
DVE
BG–A
BG–APB
BG–B
BG–BPB
FILL–1
FILL–2
Pre matrix (all crosspoints), TRS off, Colgen 1
```

Key proc test

Pressing the **"K"** key starts a test which enables testing all available key processors (three at max.).

```
KEY PROC 1
Key Proc Key
```

Main store test

Pressing the **"K"** key tests the montage processor RY 1913 (Option for DD20/DD30).

```
M O N T A G E   P R O C   R Y 1 9 1 3

Test ok.
```

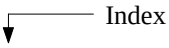
Main-matrix

Pressing the **"X"** key starts a test which enables testing the internal crossbar (matrix).
Previously, start the "Input available" test to check which inputs are available.

```
M A I N M A T R I X – T E S T

Check Input  42 43 44 34 36 38 35 45 40 49 48 47 39
  check matrix for ME1 input 34.
  check matrix for ME1 input 36.
  check matrix for ME1 input 48.
  check matrix for ME1 input 47.
  check matrix for ME1 input 39.
  check matrix for ME2 input 42.
  check matrix for ME2 input 43.
  check matrix for ME2 input 48.
  check matrix for ME2 input 47.
  check matrix for ME2 input 39.
  check matrix for ME3 input 42.
  check matrix for ME3 input 43.
  check matrix for ME3 input 34.
  check matrix for ME3 input 36.
  check matrix for ME3 input 48.
  check matrix for ME3 input 47.
  check matrix for ME3 input 39.
```

PCBs available

Pressing the **"C"** key starts a test which enables finding the p.c. boards the E-box is equipped with. In addition, the p.c.b. index is shown. This is indicated by the number before the word **found**. If one p.c. board is missing, this is indicated by the message **missing**!




```
RY 1900   Version 0 3 5  found.
RY 1911   Version 0 3 0  found.
RY 1903   Version 0 3 10 found.
RY 1943   Version 2 2 1  found.
RY 1908   Version 0 3 7  found.
RY 1900_2 Version 0 3 5  found.
RY 1903_2 Version 0 3 10 found.
RY 1903_3 Version 0 3 10 found.
RY 1943_2 Version 2 2 1  found.
RY 1943_3 Version 2 2 1  found.
RY 1909_2 Version 0 1 1  found.
RY 1908_3 Version 0 3 6  found.
RY 1913   Version 0 2 0  found.
```

Philips personnel only

Pressing the **"B"** key calls a menu function which is reserved for the **Philips** service technicans.

ACHTUNG!

Wrong entries can cause malfunctions, data losses and even complete failure of the device.

```
goto dicmac                                [D]
get testing time                           [T] (enable )
wait after test                            [W] (enable )
test keyproc RY1943                        [K] (enable )
longtime test                              [L]
set testdelay                              [1..9] [ 4]
exit normal stop                           [Y]
eeprom test                                [R]
read comperator                            [C]
test level                                 [V]
exit                                       [E]
```

Exit selftest

```
test all                                   [A]
output proc test                           [O]
me test                                    [M]
key proc test                              [K]
main-store test                            [S]
main-matrix                                [X]
PCB's  available                           [C]
Philips personnel only                     [B]
exit selftest                              [E]

* Selftest finished.
* change board RY 1903  !
* change board RY 1903_2!
* change board RY 1903_3!
```

Having terminated the video board selftest, the defective boards are be listed (see above).

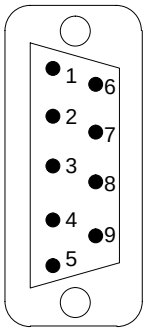
Serial ports

The serial ports of the electronics box are controlled via the slave processor of the controller.
All ports are initialized to 38.4 kbaud, 8 bits, even parity, 1 stopbit.
In the electronics box (RY 1601/1917) there are 3 serial ports.

NOTE

The pin assignment of the ports on RY 1601/ RY 1917 can be switched over between bus controller mode and tributary mode.

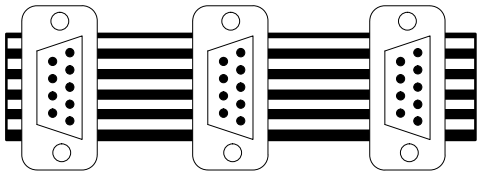
Pin assignment RS 422



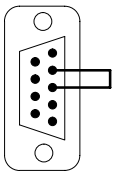
Pin	Bus-Controller		Pin	Tributary	
[1]	FG	Frame Ground	[1]	FG	Frame Ground
[6]	Rgnd	Receive gnd	[6]	Tgnd	Transmit gnd
[2]	R–	Receive –	[2]	T–	Transmit –
[7]	R+	Receive +	[7]	T+	Transmit +
[3]	T+	Transmit +	[3]	R+	Receive +
[8]	T–	Transmit –	[8]	R–	Receive –
[4]	Tgnd	Transmit gnd	[4]	Rgnd	Receive gnd
[9]	FG		[9]	FG	
[5]	nc		[5]	nc	

Test adapter

1. 9-pin flat cable with three squeezed 9-pin sub-D connectors.
   The cable connects all pins 1 : 1.



2. A 9-pin sub-D connector whose pins 2 and 3 are connected.



Test RS-422 Ports

Connect the three ports of the E-box with the flat cable.
To test these RS-422 and RS 232 interfaces call the Slave menu. For this purpose, the terminal has to be connected to the corresponding socket on the controller. The port test can be called in the Main menu via the function ”Integrated error diagnosis” in the submenu ”Interactive tests”.

The terminal displays the following message:

```
Sending U on Port1 configured as Bus-Controller
character count
```

not		P01	P01	P01	P02	P02	P02	P03	P03	P03
sent	sent	rcvd	erro	unex	rcvd	erro	unex	rcvd	erro	unex
00	00	00	00	00	00	00	00	00	00	00

Port 1 is configurated as bus controller (the other ones as tributaries). In an interval of approx. 0.1 sec, the following will happen:

Character ”U” is sent once with **enabled** bus driver and ”sent” is increased by ”1”. Then is checked whether the character has been received correctly.

If the character was

- not received: no increase at the corresponding port
- received: ”rcvd” is increased by ”1” at the corresponding port
- incorrectly received: ”erro” is increased by ”1” at at the corresponding port

With the flat cable, the ports 2 and 3 should now receive and port 1 not.

Character ”U” is sent once with **disabled** bus driver and ”not sent” is increased by ”1”. Then is checked whether the character has been received correctly.

If the character was

- not received: no increase at the corresponding port
- received: ”unex” is increased by ”1” at the corresponding port
- incorrectly received: ”erro” is increased by ”1” at the corresponding port

Now, it should not be received. The counters are indicated. If an error occurs, the terminal displays ”FAIL” instead of ”OK”.

For the next test, port 1 is configurated as tributary (the other ones as bus controllers). In an interval of approx. 0.1 sec, the above procedure is repeated.

Subsequently, the ports 2 and 3 are tested in the same way.

Test RS 232 Port

The RS 232 port is tested with the short-circuit plug. The terminal displays the following message:

```
Sending U on RS 232 Port
```

sent	rcvd	erro
00	00	00

In an interval of approx. o.1 sec, ”U” is sent and checked whether it was correctly received and correspondingly counted. If an error occurs, the terminal displays ”FAIL” instead of ”OK”.

Note: No bus driver is switched.

4.3 ERROR MESSAGES

No	Error	Device
01	watchdog reset	Panel E-Box
02	V missing	
03	V too fast	
04	V too slow	
05	main display controller	
06	file contents lost: FILE NAME	
07	CHEAPERNET interface	
08	CHEAPERNET cabling	
09	CHEAPERNET send failed	
10	low battery voltage	Panel E-Box
11	too many devices at CHEAPERNET	
12	button display controller	
13	no CHEAPERNET communication	
14	realtime clock	
15		
16	V-PLL not locked	
17	power supply I	
18	power supply II	
19	too many panels	
20	port: no communication	Panel E-Box
21	port: transmitter defekt	
22	port: polled tributary busy	
23	port: network information lost	
24	port: protokol error	
25	port: system service error received	
26	port: destin. tributary unavailable	
27	port: communication distorted	
28	port: common error mess. received	
29	port: network too large	

No	Error	Device
30	port2: no communication	E-Box
31	port2: transmitter defekt	
32	port2: polled tributary busy	
33	port2: network information lost	
34	port2: protokol error	
35	port2: system service error received	
36	port2: destin. tributary unavailable	
37	port2: communication distorted	
38	port2: common error mess. received	
39	port2: network too large	
40	port3: no communication	E-Box
41	port3: transmitter defekt	
42	port3: polled tributary busy	
43	port3: network information lost	
44	port3: protocol error	
45	port3: system service error received	
46	port3: destin. tributary unavailable	
47	port3: communication distorted	
48	port3: common error mess. received	
49	port3: network too large	
50	DUART 1	Panel E-Box
51	Interrupt 3	
52	EPROM checksum bank x/y	
53	RAM	
54	DUARD 2	
55	Interrupt 2	
56	I/O to boards	
57	too many foreign devices	
58	Memory Disk	
59	file contents lost: Disk	

No	Error	Device
60	Input Proc.1	E-Box
61	Input Proc.2	
62	Input Proc	
63	ME Proc.1	
64	ME Proc.2	
65	ME Proc.3	
66	ME Proc	
67	Key Proc	
68	Key Proc.1	
69	Key Proc.2	
70	Key Proc.3	E-Box
71	Wipe Proc	
72	Wipe Proc.1	
73	Wipe Proc.2	
74	Wipe Proc.3	
75	Out Proc	
76	low –5V	
77	Genlock ref.	
78	Bankload	
79	Clock	
80	V-proc	E-Box
81	Field Puls	
82	Vert. Puls	
83	H-Input Puls	
84	H-F Puls	
85	H-S Puls	
86	H- P Puls	
87	H-Out Puls	
88	H-Aux Puls	
89	+ Power supply failed!	
90	– Power supply failed!	E-Box
91	read/write to RM1923 failed!	

5. SPARE PARTS

In order to avoid unnecessary waiting times and inquiries, the following indications have been made when ordering spare parts:

1. Serial number, quantity and designation
2. Device type and factory number
3. Indications of all supplied options.

If the serial number cannot be indicated, we need indications of the device type, factory number, subassembly and if required position of the component.

The same applies to the spare parts of units not manufactured by us, with additional indication of the manufacturer.

Inquiries concerning the part identification please send to

Sales Department Spare Parts

Telefon (06155) 870 419, 870 715
Telefax (06155) 894 578

or to your competent spare parts sales agency.

The spare parts with order numbers ending with ...90 are very low-priced exchange parts which are fully warranted by Philips.
The quality of exchange parts correspond to the quality of new parts.

Furthermore, Philips offers service kits which do not contain exchange boards, but only new parts.

5.1 SERVICE KITS

5.1.1 SWITCHER EBOX DD5

Type	*Designation*	*Order Number*
RC 1974	**Service Kit 5**	**0 212 188 900**
contains:		
RY 1914	Genlock/Output Processor	
RY 1917	Controller	
RC 1929	Power Supply	
RC 1975	**Service Kit 6**	**0 212 189 000**
contains:		
RY 1902	Input Processor	
RY 1903	ME Processor	
RY 1914	Genlock/Output Processor	
RY 1917	Controller	
RC 1929	Power Supply	

5.1.2 SWITCHER EBOX DD10

Type	*Designation*	*Order Number*
RC 1964	**Service Kit 1**	**0 212 187 900**
contains:		
RY 1912	Genlock/Output Processor	
RY 1917	Controller	
RC 1929	Power Supply	
RC 1965	**Service Kit 2**	**0 212 188 000**
contains:		
RY 1902	Input Processor	
RY 1903	ME Processor	
RY 1912	Genlock/Output Processor	
RY 1917	Controller	
RC 1929	Power Supply	

5.1.3 SWITCHER EBOX DD20 AND DD30

Type	*Designation*	*Order Number*
RC 1966	**Service Kit 3**	**0 212 188 100**
contains:		
RY 1916	Genlock/Output Processor (without Aux Extension)	
RY 1917	Controller	
RC 1926	Power Supply (Standard)	
RC 1967	**Service Kit 4**	**0 212 188 200**
contains:		
RY 1900	Input Processor	
RY1903	ME Processor	
RY 1916	Genlock/Output Processor (without Aux Extension)	
RY 1917	Controller	
RC 1926	Power Supply (Standard)	

5.2 SPARE PARTS

5.2.1 CONTROL PANEL RPD 5

	Type	*Designation*	*Order Number*
Control panel cover	RX 1880	Keyboard	0 351 670 190
	RC 1858	Fader Assembly	0 351 661 200
Underdesk part	RY 1822	Controller	0 351 692 390
		Lithium Battery	3 119 100 195
	RC 1882	Power Supply	0 351 670 300
Diverse		PC Mouse	3 114 019 010

5.2.2 ELECTRONICS BOX RMD 5

	Type	*Designation*	*Order Number*
Plug-in boards	RY 1902	Input Processor	0 212 180 390
	RY 1903	ME Processor	0 212 180 490
	RY 1907	Key Processor 1 (without ChrKey)	0 212 180 890
	or		
	RY 1906	Key Processor 1 (with ChrKey)	0 212 180 790
	RY 1910	Wipe Processor	0 212 181 090
	RY 1914	Genlock/Output Processor	0 212 181 590
	RY 1917	Controller	0 212 181 890
		Lithium Battery	3 119 100 195
Blower	RC 1919	Blower Unit	0 212 182 000
Power supply	RC 1929	Power Supply	0 212 183 000

5.2.3 CONTROL PANEL RPD 10

	Type	*Designation*	*Order Number*
Control panel cover	RX 1850	Crossbar Selection	0 351 660 190
	RX 1852	Transition Selection	0 351 660 390
	RC 1858	Fader Assembly	0 351 661 200
		Trackball	3 114 019 002
Underdesk part	RY 1822	Controller	0 351 692 390
		Lithium Battery	3 119 100 195
	RC 1832	Power Supply	0 351 693 900
Diverse		PC Mouse	3 114 019 010

5.2.4 ELECTRONICS BOX RMD 10

	Type	*Designation*	*Order Number*
Plug-in boards	RY 1901	Input Processor	0 212 180 290
	RY 1903	ME Processor	0 212 180 490
	RY 1907	Key Processor (without ChrKey)	0 212 180 890
	or		
	RY 1906	Key Processor (with ChrKey)	0 212 180 790
	RY 1943	Key Processor 2 (with ChrKey)	0 212 184 490
	or		
	RY 1944	Key Processor 2 (without ChrKey)	0 212 184 590
	RY 1909	Wipe Processor (1x WP)	0 212 181 090
	or		
	RY 1908	Wipe Processor (2x WP)	0 212 180 990
	RY 1912	Genlock/Output Processor	0 212 181 390
	RY 1917	Controller	0 212 181 890
		Lithium Battery	3 119 100 195
Blower	RC 1919	Blower Unit	0 212 182 000
Power supply	RC 1929	Power Supply	0 212 183 000

5.2.5 CONTROL PANEL RPD 20

	Type	*Designation*	*Order Number*
Control panel cover	RX 1816.12	Wipe Selection	0 351 693 590
	RX 1819	Display Selection	0 351 692 090
	RX 2000	Display Board	0 351 680 190
	RX 2001	Crossbar Selection 1	0 351 680 290
	RX 2002	Crossbar Selection 2	0 351 680 390
	RX 2003	Transition Selection	0 351 680 490
	RX 2004	EXTRA Selection	0 351 680 590
	RX 2005	Chroma Key Selection	0 351 680 690
	RC 1858	Fader Assembly	0 351 661 200
		Trackball	3 114 019 002
		Disk Drive 3.5”	3 119 100 245
		Display	3 120 300 000
Underdesk part	RY 1822	Controller	0 351 692 390
		Lithium Battery	3 119 100 195
	RC 1831	Power Supply (redundant)	0 351 693 200
	RC 1832	Power Supply (standard)	0 351 693 900
Diverse		PC Mouse	3 114 019 010

5.2.6 ELECTRONICS BOX RMD 20

	Type	*Designation*	*Order Number*
Plug-in boards	RY 1900	Input Processor	0 212 180 190
	RY 1903	ME Processor	0 212 180 490
	RY 1907 or RY 1906	Key Processor (without ChrKey) Key Processor (with ChrKey)	0 212 180 890 0 212 180 790
	RY 1943 or RY 1944	Key Processor 2 (with ChrKey) Key Processor 2 (without ChrKey)	0 212 184 490 0 212 184 590
	RY 1909 or RY 1908	Wipe Processor (1x WP) Wipe Processor (2x WP)	0 212 181 090 0 212 180 990
	RY 1916 or RY 1911	Genlock/Output Processor Genlock/Output Processor (AUX-Ext.)	0 212 181 790 0 212 181 290
	RY 1917	Controller	0 212 181 890
		Lithium Battery	3 119 100 195
	RY 1913	Montage Processor	0 212 181 490

Blower	RC 1920	Blower Unit	0 212 182 100
Power supplies	RC 1926	Power Supply (standard)	0 212 182 700
	RC 1928	Power Supply (redundant)	0 212 182 900
	RC 1931	Mains Control	0 212 183 200

5.2.7 CONTROL PANEL RPD 30

	Type	***Designation***	***Order Number***
Control panel cover	RX 1800	Crossbar Selection 1 (ME left)	0 351 690 190
	RX 1801	Crossbar Selection 2 (ME right)	0 351 690 290
	RX 1802	Crossbar Selection 3 (PP left)	0 351 690 390
	RX 1803	Crossbar Selection 4 (PP right)	0 351 690 490
	RX 1806	Transition Selection 1 (ME 1)	0 351 690 790
	RX 1807	Transition Selection 2 (ME 2/PP)	0 351 690 890
	RX 1811	Chroma Key Selection	0 351 691 290
	RX 1812	EXTRA Selection	0 351 691 390
	RX 1816.11	Wipe Selection	0 351 691 790
	RX 1817	Mask Selection	0 351 691 890
	RX 1818	Store Selection	0 351 691 990
	RX 1819	Display Selection	0 351 692 090
	RC 1858	Fader Assembly	0 351 661 200
		Trackball	3 114 019 002
		Disk Drive 3.5”	3 119 100 245
		Display	3 120 300 000
Underdesk part	RY 1822	Controller	0 351 692 390
		Lithium Battery	3 119 100 195
	RC 1831	Power Supply (redundant)	0 351 693 200
	RC 1832	Power Supply (standard)	0 351 693 900
Diverse		PC Mouse	3 114 019 010

5.2.8 ELECTRONICS BOX RMD 30

	Type	***Designation***	***Order Number***
Plug-in boards	RY 1900	Input Processor	0 212 180 190
	RY 1903	ME Processor	0 212 180 490
	RY 1907	Key Processor (without ChrKey)	0 212 180 890
	or		
	RY 1906 (Option)	Key Processor (with ChrKey)	0 212 180 790
	RY 1943	Key Processor 2 (with ChrKey)	0 212 184 490
	or		
	RY 1944	Key Processor 2 (without ChrKey)	0 212 184 590

	RY 1909 or RY 1908 (Option)	Wipe Processor (1x WP) Wipe Processor (2x WP)	0 212 181 090 0 212 180 990
	RY 1912 or RY 1911 (Option)	Genlock/Output Processor Genlock/Output Processor (AUX-Ext.)	0 212 181 390 0 212 181 290
	RY 1917	Controller Lithium Battery	0 212 181 890 3 119 100 195
	RY 1913 (Option)	Montage Processor	0 212 181 490
Blower	RC 1920	Blower Unit	0 212 182 100
Power supplies	RC 1926 RC 1928 RC 1931	Power Supply (standard) Power Supply (redundant) Mains Control	0 212 182 700 0 212 182 900 0 212 183 200

5.2.9 CONTROL PANEL RPD 20 M

	Typ	*Benennung*	*Bestellnummer*
Control panel cover	RX 1255	MCS Key Board 1	0 351 720 100
	RX 2056	MSC Key Board 2	0 351 720 200
	RC 1858	Fader Assembly	0 351 661 200
	RC 2061	Audio Fader kpl.	0 351 720 800
Underdesk part	RY 1822	Controller	0 351 692 390
		Lithium Battery	3 119 100 195
	RC 2059	Power Supply	0 351 720 500

5.2.10 ELECTRONICS-BOX RMD 20 M

	Typ	*Benennung*	*Bestellnummer*
Plug-in boards	RY 1900	Input Processor	0 212 180 190
	RY 1903	ME Processor	0 212 180 490
	RY 1944	Key Processor	0 212 184 590
	RY 1916	Genlock/Output Processor	0 212 181 790
	RY 1917	Controller	0 212 181 890
		Lithium Battery	3 119 100 195
Blower	RC 1920	Blower Unit	0 212 182 100
	RC 2064	Blower Board	0 212 210 800
Power supplies	RC 1926	Power Supply	0 212 182 700
	RC 1931	Mains Control	0 212 183 200

6. MOUNTING PARTS AND SUBASSEMBLIES

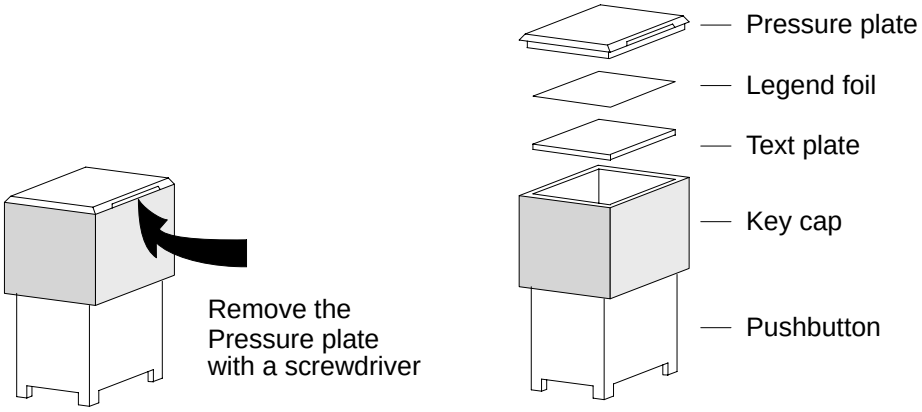
6.1 INSERTABLE LEGEND PLATES

Exchanging the legend plates

The control panels have two key sizes. For source selection and the most important functions such as **Cut** and **Auto** on the Transition panel, keys are used having a side length of 18.6 mm. For the other functions, keys are used having a side length of 12.2 mm. Ecxept for the external source keys, all keys are provided with an insertable foil showing the functions or the wipe pattern symbol.

For switcher types without the ”Input Mnemonics” option, legend plates have to be inserted into the keys of the primary sources. The legend plates have to be square, the side length has to be 15.5 mm.

Inserting the legend plate is shown on the figure below.



6.2 EXCHANGING THE LITHIUM BATTERY

The switcher electronics as well as the control panels employ microcomputers which contain a lithium battery. The battery supplies the working store with voltage, thus storing the last data set when the voltage suppy of the unit is switched off or interrupted. When switching on again, the switcher resumes its last-selected operating mode with all parameters.

The following subassemblies contain a lithium battery:

Device	Type	Plug-in board
E-box	RMD 5	Controller RY1917 / RY1601
E-box	RMD 10	Controller RY1917 / RY1601
E-box	RMD 20 (M)	Controller RY1917 / RY1601
E-box	RMD 30	Controller RY1917 / RY1601
Control panel	RPD 5	Controller RY1821 / RY1822
Control panel	RPD 10	Controller RY1821 / RY1822
Control panel	RPD 20	Controller RY1821 / RY1822
Control panel	RPD 30	Controller RY1821 / RY1822

According to the specifications by the manufacturer, the lithium battery has a life time of up to 10 years. To ensure that no data loss will occur in the off-state, Philips recommends as a precaution to exchange the lithium battery after **5 years** of operation. A label with an adequate note is provided on the unit.

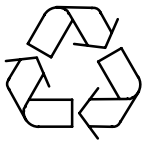
A spare battery can be ordered from **Philips** under the order number 3 119100195 or on the market under the type designation VARTA CR1/2 AA.

Prior to battery exchange, make a backup of all data on a disk via ”Kermit” (see the Service menu). After having exchanged, reload the data.
The ID number has to be entered anew.

For exchanging, the respective plug-in card has to be removed from the unit. The lithium battery is soldered to the p.c. board. Note the polarity when mounting. The p.c. boards are marked accordingly.

Attention

Danger of explosion when the battery is not correctly inserted. Replace the battery only by a battery from the same manufacturer or by an equivalent type recommended by the manufacturer.



Protect the environment!

Dead batteries do not belong in the garbage. Hand the used batteries over to a local disposal place or observe the respective instructions of the manufacturer!

6.3 TRACKBALL

The trackball is available in the control panels RPD 20 and RPD 30 and fastened with a mounting plate as well as three hex nuts.

Excecution

1. Switch off the control panel and pull the power plug.
2. Tilt up the control panel.
3. Unlock the connection cable at the trackball and pull it off.
4. Loosen the 3 hex nuts ”A” (see Fig. 1) at the mounting plate.
5. Remove the trackball.

Mounting has to be made in reverse order.

Order no.: 3 114 019 002

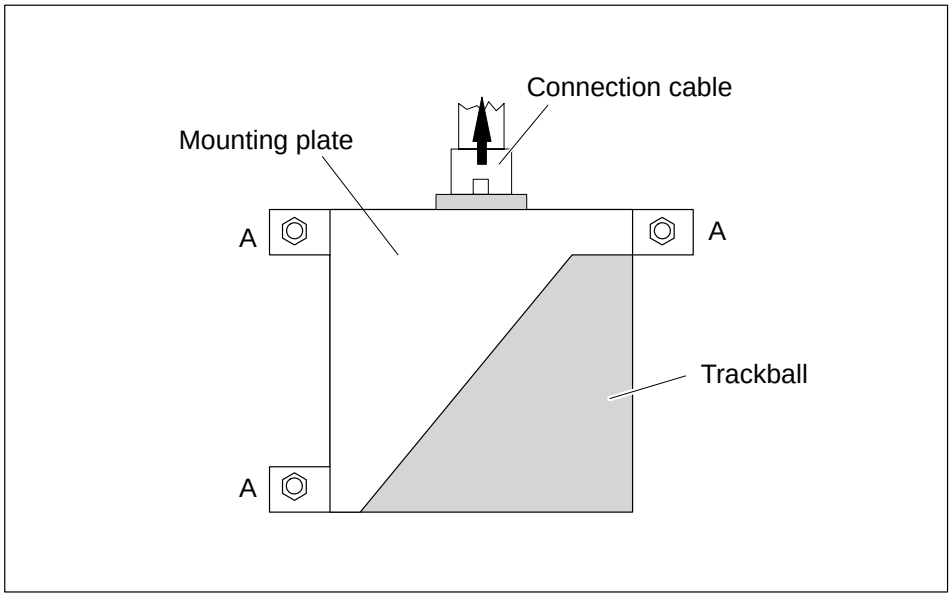


Fig. 1: Trackball

6.4 DISK DRIVE 3.5”

The disk drive is provided in the control panels RPD 20 and RPD 30. It is fastened with two mounting brackets and four hex nuts.

Excecution

1. Switch off the control panel and pull the power plug.
2. Tilt up the control panel.
3. Pull off the flat cable at the disk drive.
4. Loosen the 4 hex nuts ”A” (see Fig. 2).
5. Remove the disk drive.

Mounting has to be made in reverse order.

Order no.: 3 119 100 245

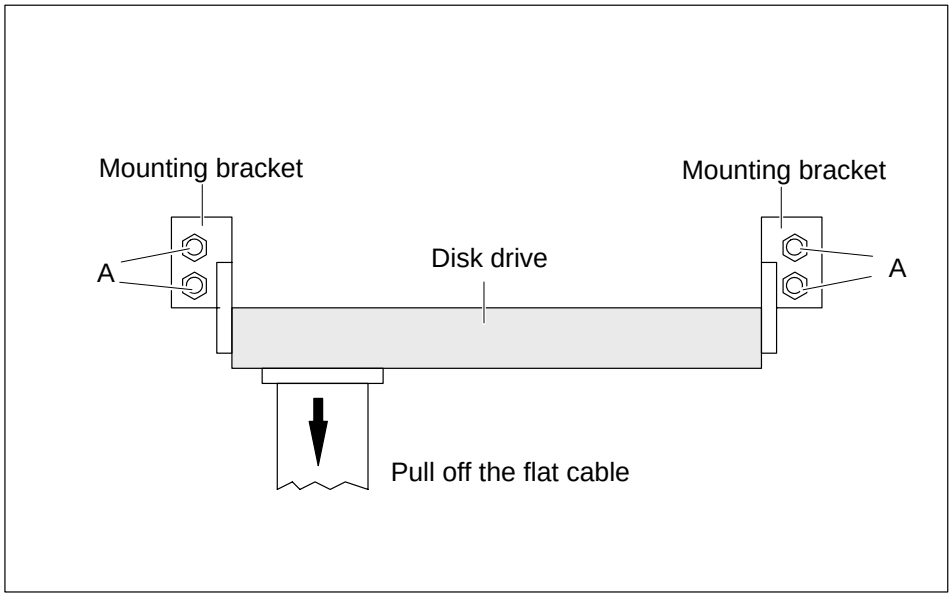


Fig. 2: Disk drive 3.5”

6.5 FADER RC1858

The fader is provided in each control panel and fastened with two hex spacers.

Excecution

1. Switch off the control panel and pull the power plug.
2. Pull off the two plastic handles and the shaft at the fader handle (see Fig. 3).
3. Tilt up the control panel.
4. Pull off the flat cable at lower side of the fader.
5. Loosen the 2 hex spacers ”A” (see Fig. 4).
6. Remove the fader.

Mounting has to be made in reverse order.

Order no.: 0 351 661 200

NOTE

When mounting, note the following:

The faders are provided with one connection board RC 1855 each. A 4-fold DIP switch (T1) on the fader connection board determines the input channel of the 12-bit A/D converter.

On each one of these connection boards, exactly one switch has to be set to ON, the others have to be set to OFF!

Assignment is as follows: Switch no. 1 : ME1
2 : ME2
3 : PP
4 : EXTRA

The faders in the control panels DD5 and DD10 have to be configurated for ”ME1”. The three faders in the DD20 panel have to be configurated for ”ME”, ”PP” and ”EXTRA”. The fader of the DD20M have to be configured for ”PP”

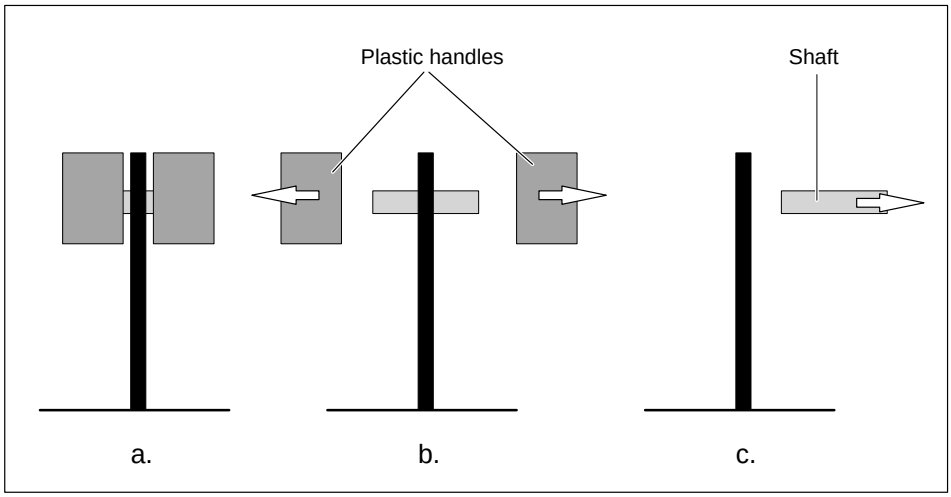


Fig. 3: Fader handle

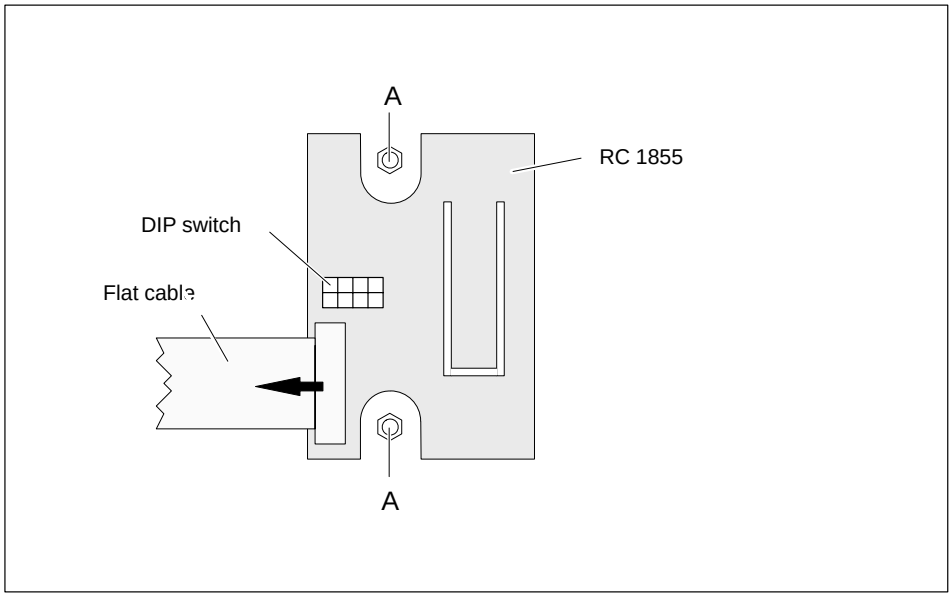


Fig. 4: Lower side of the fader

6.6 DISPLAY

The display is provided on the control panels RMD 20 and RMD 30. It is fastened with a sheet plate and 8 screws to the legend plate.

The protection glass of the display is non scratch-proof and non shock-proof. In order to prevent the risk of injury, take care that no parts drop on the display. Please replace a damaged display immediately.

Excecution

1. Switch off the control panel and pull the power plug.
2. Tilt up the control panel.
3. Pull off the flat cable at the lower side of the display.
4. Loosen the four screws ”A”.
5. Remove the display with the sheet plate.
6. Loosen the four screws ”B”.
7. Remove the sheet plate from the display.

Mounting has to be made in reverse order.

Order no.: 3 120 300 000

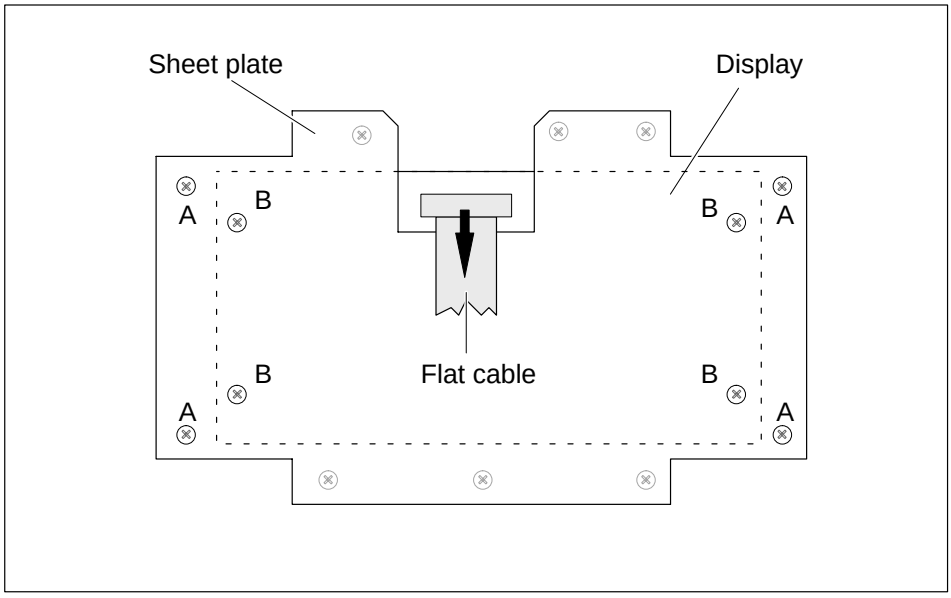


Fig. 5: Lower side of the display

6.7 CONTROL PANEL P.C. BOARDS

P.c. boards in the control panel

The p.c. boards in the control panel cover are fastened with crosshead screws.

Excecution

1. Switch off the control panel and pull the power plug.
2. Tilt up the control panel.

For the p.c. board to be removed:

3. Pull off the flat cable and the dc voltage cabling.
4. Loosen the crosshead screws marked with an arrow symbol (=>) on the p.c. board.
5. Cautiously remove the p.c. board.

Mounting has to be made in reverse order.

P.c. boards in the underdesk part

The underdesk part contains the controller board and the power supply board. The two p.c. boards are located on a common bottom plate which is fastened with 6 fastening nuts. The connector sockets are firmly connected with the controller board.

Excecution

1. Switch off the control panel and pull the power plug.
2. Tilt up the control panel.
3. Pull off the flat cable and the dc voltage cabling.
4. Remove the 6 fastening nuts from the bottom plate.
5. Remove the bottom plate with the two p.c. boards from the desk.

For the p.c. board to be removed:

6. Loosen the crosshead screws marked with an arrow symbol (=>) on the p.c. board.
7. Cautiously remove the p.c. board.

Mounting has to be made in reverse order.

6.8 E-BOX P.C. BOARDS

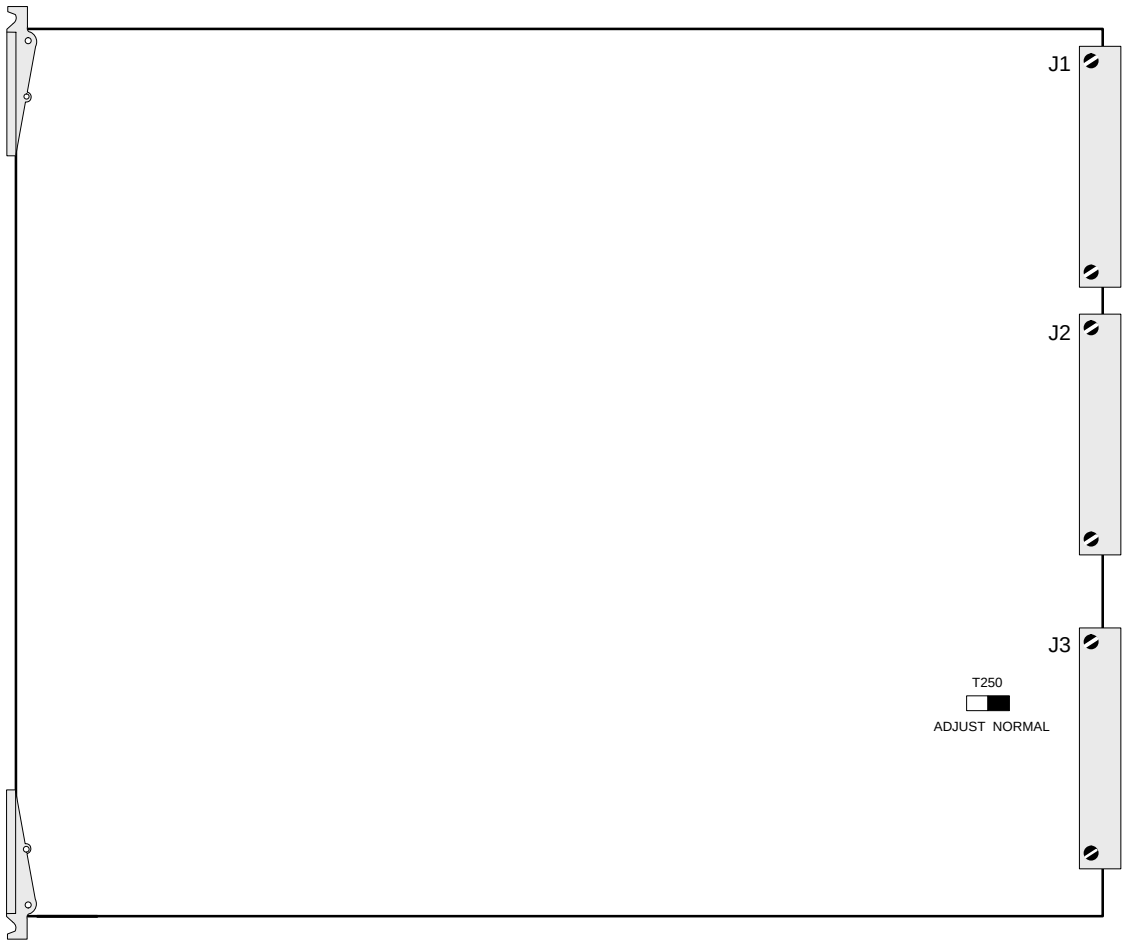
The electronics boxes contain individual plug-in cards of the video and control electronics as well as the power supplies. They can be easily removed or exchanged. Distribution and connection boards cannot be exchanged.

Excecution

1. Switch off the control panel and pull the power plug.
2. Open the door of the E-box.
3. Unlock the respective p.c. board/power supply in the frame and pull it out of the frame.

NOTE **When inserting or exchanging the p.c. boards, note that the switches on the respective boards are set to the correct positions (see the next section).**

6.8.1 INPUT PROCESSOR RY1900 / RY1901 / RY1902

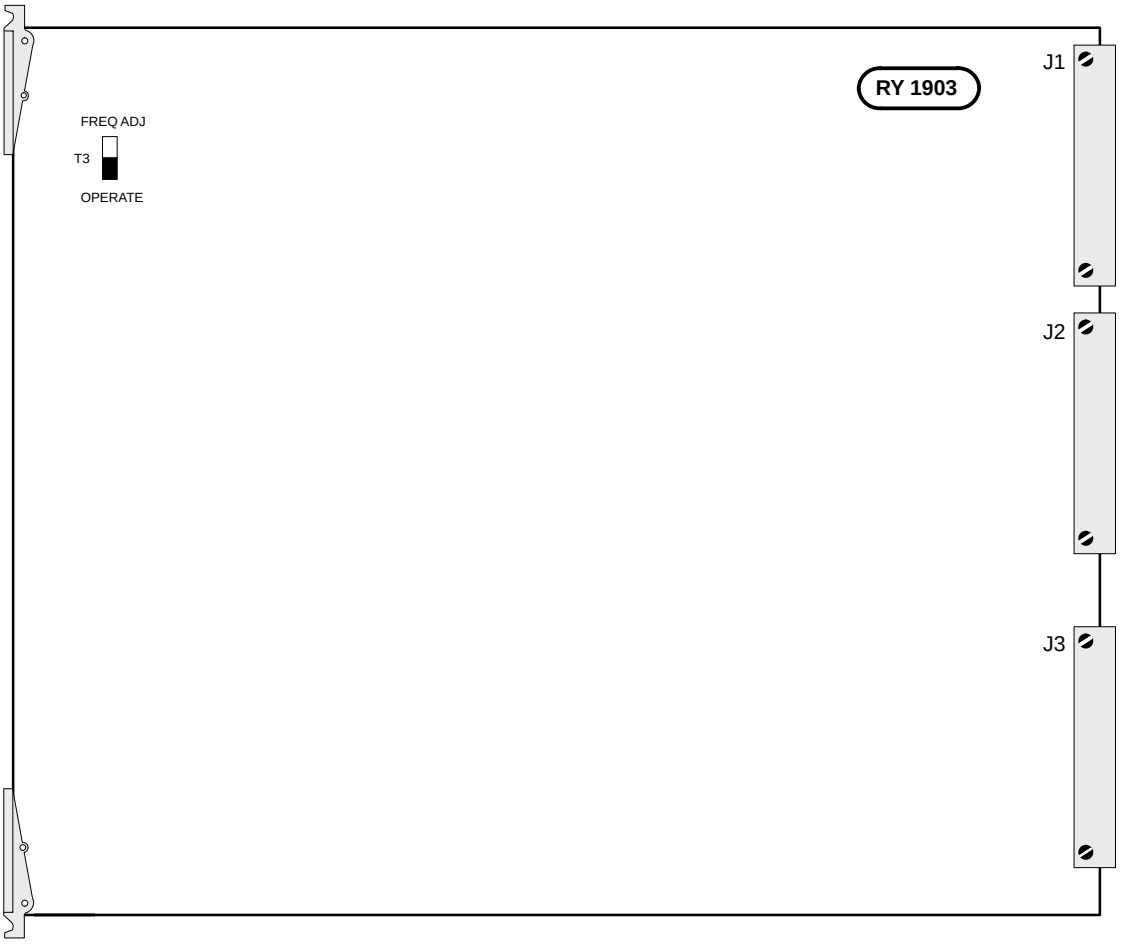


*Switch **ADJUST** (T250)*

The switch has to be set to position NORMAL.

Further details are contained in section 3 ”Functional Description”.

6.8.2 ME PROCESSOR RY1903

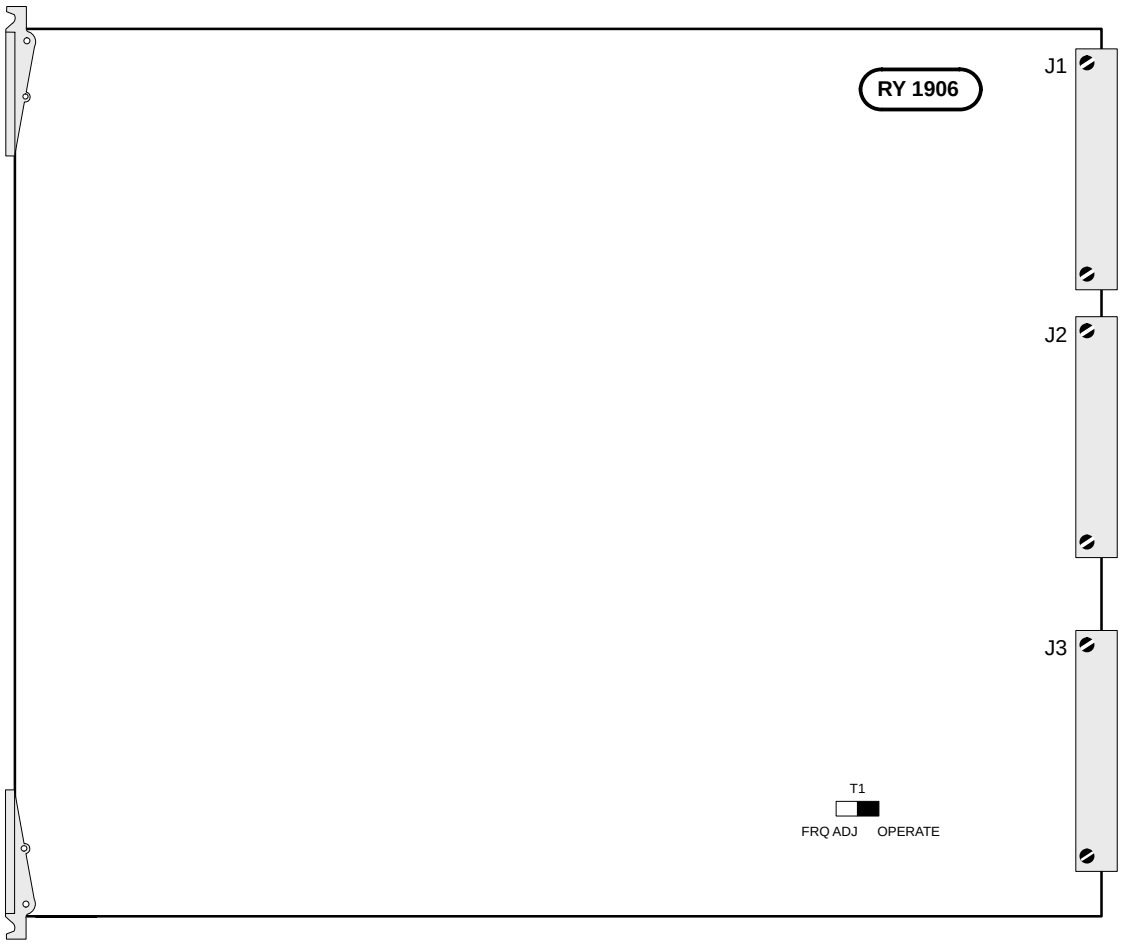


*Switch **FREQ ADJ** (T3)*

The switch has to be set to position OPERATE.

Further details are contained in section 3 ”Functional Description”.

6.8.3 KEY PROCESSOR RY 1905 / RY1906 / RY1907

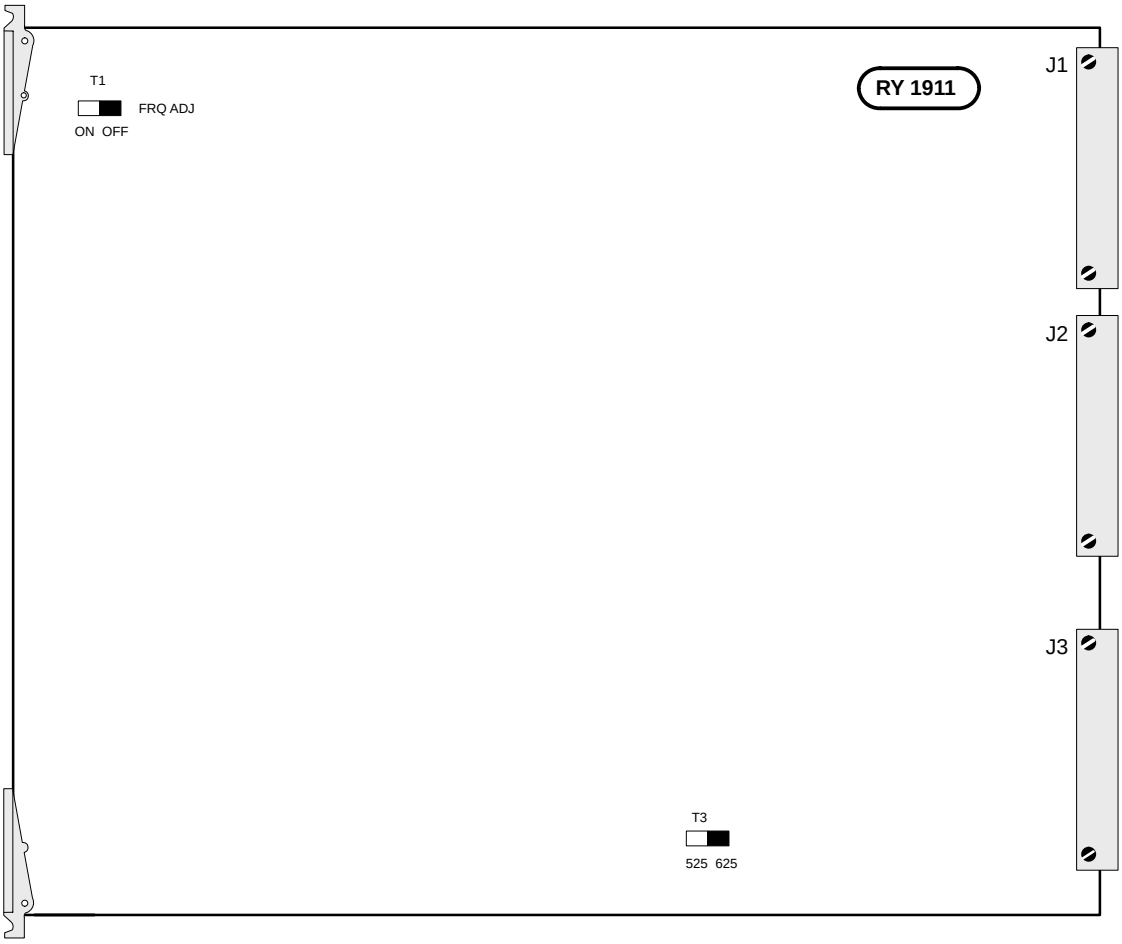


*Switch **FREQ ADJ** (T1)*

The switch has to be set to position OPERATE.

Further details are contained in section 3 ”Functional Description”.

6.8.4 OUTPUT PROCESSOR RY1911 / RY1912 / RY1914



*Switch **FRQ ADJ** (T1)*

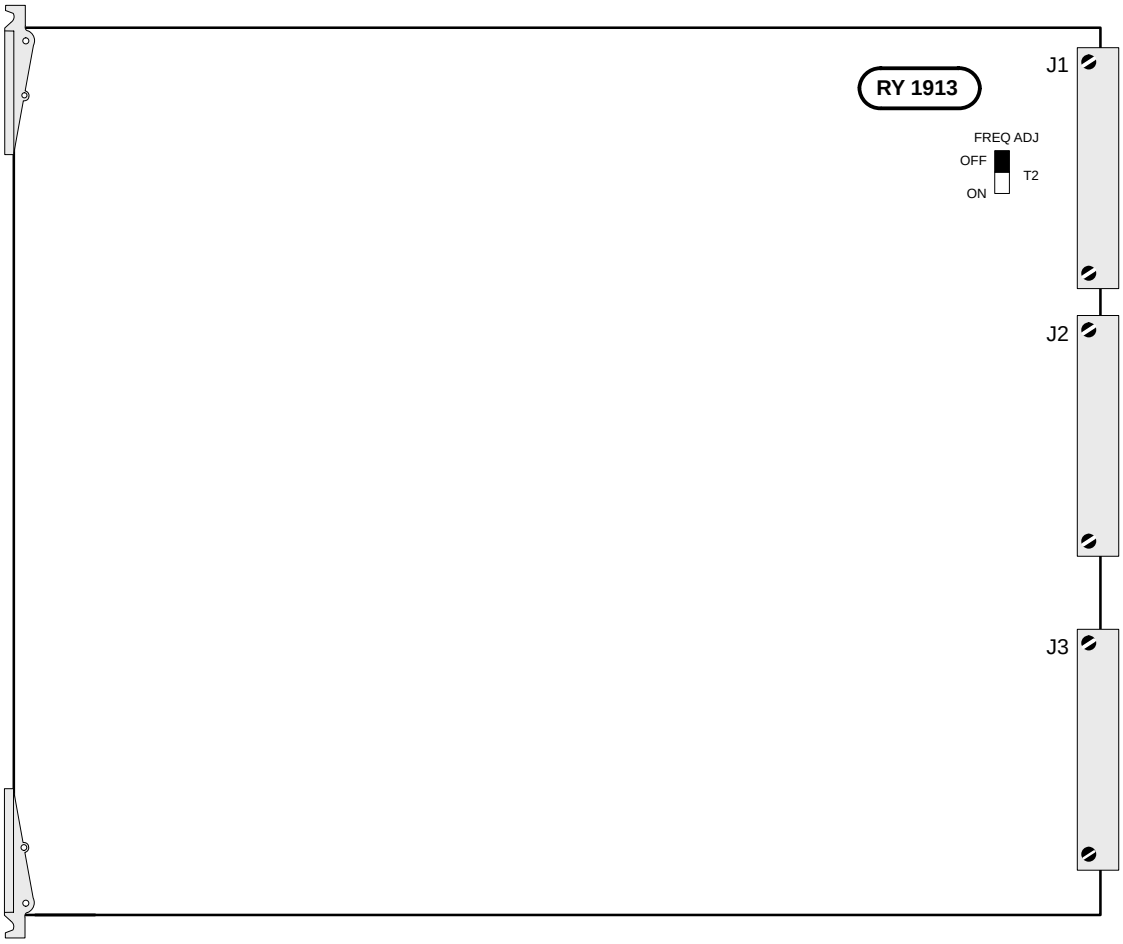
The switch has to be set to position OFF.

Further details are contained in section 3 ”Functional Description”.

*Switch **NORM** (T3)*

Standard selection for 525-line and 625-line operation.
The switch must be actuated only with the supply voltage switched off. Furthermore, a reference signal of the corresponding standard should be applied before switching on again.

6.8.5 MONTAGE PROCESSOR RY1913

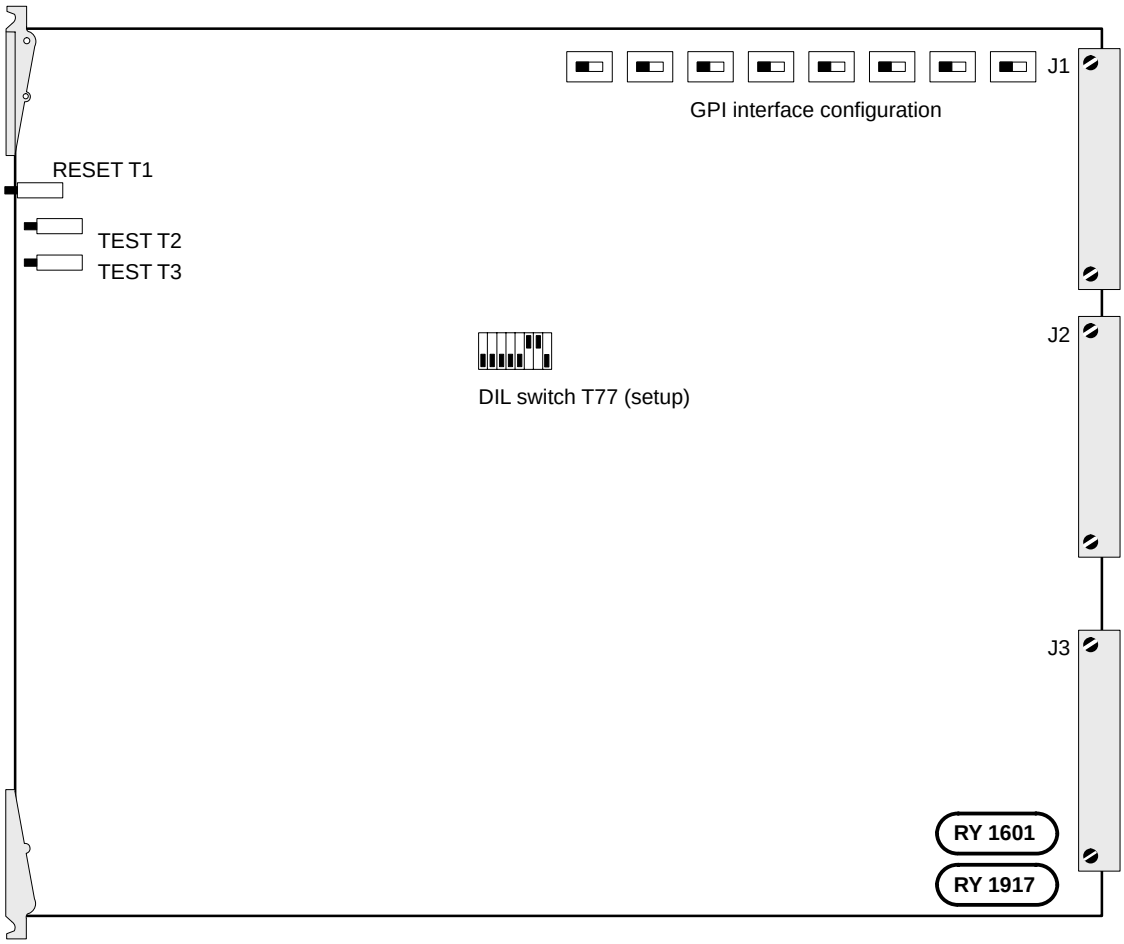


*Schalter **FRQ ADJ** (T2)*

The switch has to be set to position OFF.

Further details are contained in section 3 ”Functional Description”.

6.8.6 CONTROLLER RY1917



*Key **RESET** (T1)*

Microcomputer reset. Simultaneous resetting of the master and the slave microcomputer.

*Keys **TEST** (Master T2) (Slave T3)*

If these keys are pressed when releasing the reset key, the respective microcomputer does not enter the normal operating program, but the so-called ”Monitor” mode.
This is a minimum system which is operative in the EPROMs. For the duration the microcomputer is in the monitor mode, the red error LED will blink.

This mode is intended for Philips-internal use only.

*DIL switch **SETUP** (T77)*

8-fold switch T8 for adjusting the device type. The respective switch position is only inquired after a reset, i.e. a change of the switch position becomes only effective after a reset.
The switch position can also be inquired at the service terminal with the program selection "V" (software version).

The switches have the following functions:

Switch	**Position** **On = 1** **Off = 0**	**Meaning**
1		unused
2...4	 000 001 010 011 100 101 110 111	Device type of box: DD30 box DD10 box DD20 box DD5 box unused unused unused unused

***GPI configuration** (T47-T49, T56-T58, T67, T68)*

The slide switches T47, T48, T49, T56, T57, T58, T67 and T68 are assigned to the GPI inputs 1...8 (general-purpose inputs). These inputs are provided with optocouplers. The switches enable assignment of the inputs to different control concepts:

Switch in position "1" (position "left")

A simple connection between the two connectors activates the corresponding input. This kind of control is suitable for a connection to a relay contact or an open-collector output.

Attention: In this case, both lines are connected with the circuit ground. When connecting to an open-collector output, there is no ground potential isolation between the switcher electronics and controlling devices.

Since the circuit ground is led out of the device, the cabling has to be shielded for this kind of control. Non-shielded cables may cause EMC and/or ESD problems!

Switch in position "2" (position "right")

The optocoupler-internal LED is made available at the two connectors (including 1kΩ drop resistor). For this kind of control, a ground potential isolation is provided; the controlling device, however, has to impress a current upon the LED, i.e. a simple contact is not suited in this case.
Due to the ground potential isolation, the cabling is less critical for this kind of control.

6.9 BLOWER UNIT RC1919

Blower unit RC 1919 of the E-boxes RMD 5 and RMD 10 is fastened with four crosshead screws ”A”.

Excecution

1. Switch off the E-box and pull the power plug.
2. Loosen the 4 crosshead screws at the blower unit (see Fig. 6).
3. Pull off the connection cable from the distribution board.
4. Remove the blower unit.

Mounting has to be made in reverse order.

Order no.: 0 212 182 000

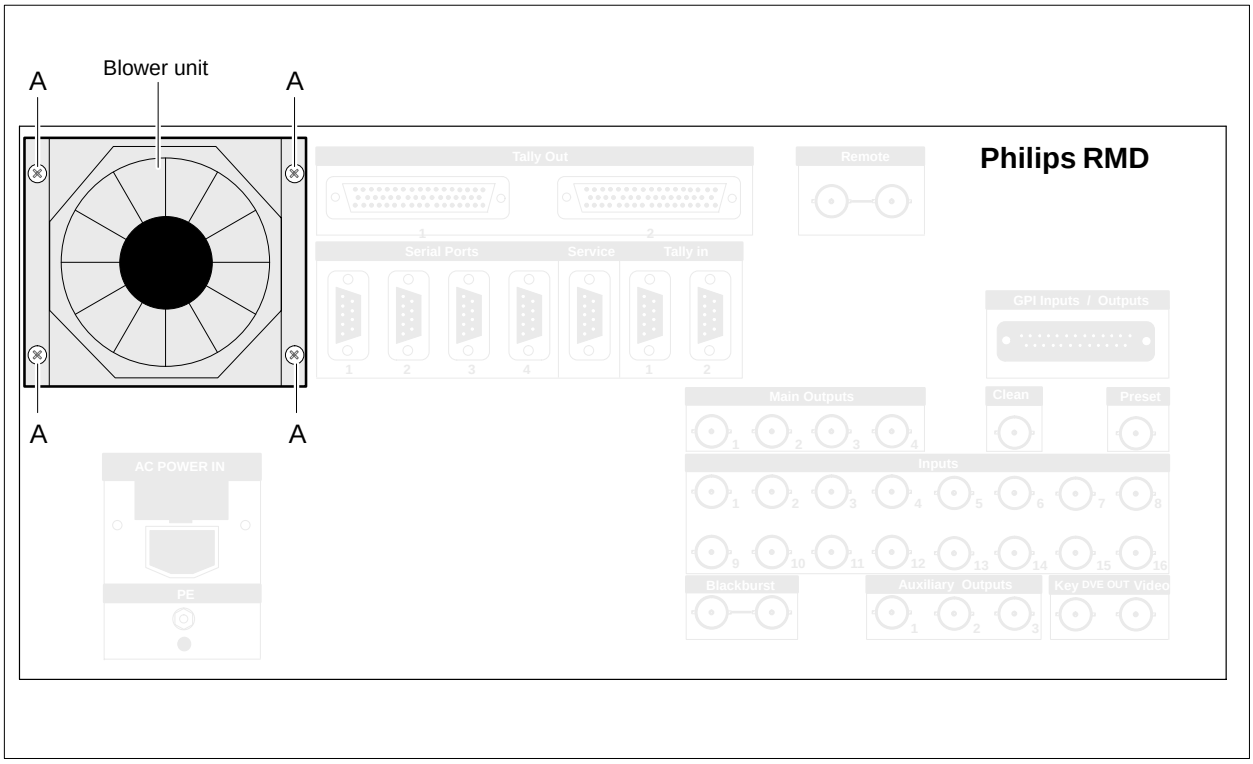


Fig. 6: Rear panel of E-box RMD 5/10

6.10 BLOWER UNIT RC 1920

Blower unit RC 1920 of the E-boxes RMD20 and RMD 30 is fastened with six crosshead screws.

Excecution

1. Switch off the E-box and pull the power plug.
2. Loosen the 6 crosshead screws ”A” at the blower unit (see Fig. 7).
3. Pull off the connection cable from the distribution board.
4. Remove the blower unit.

Mounting has to be made in reverse order.

Order no.: 0 212 182 100

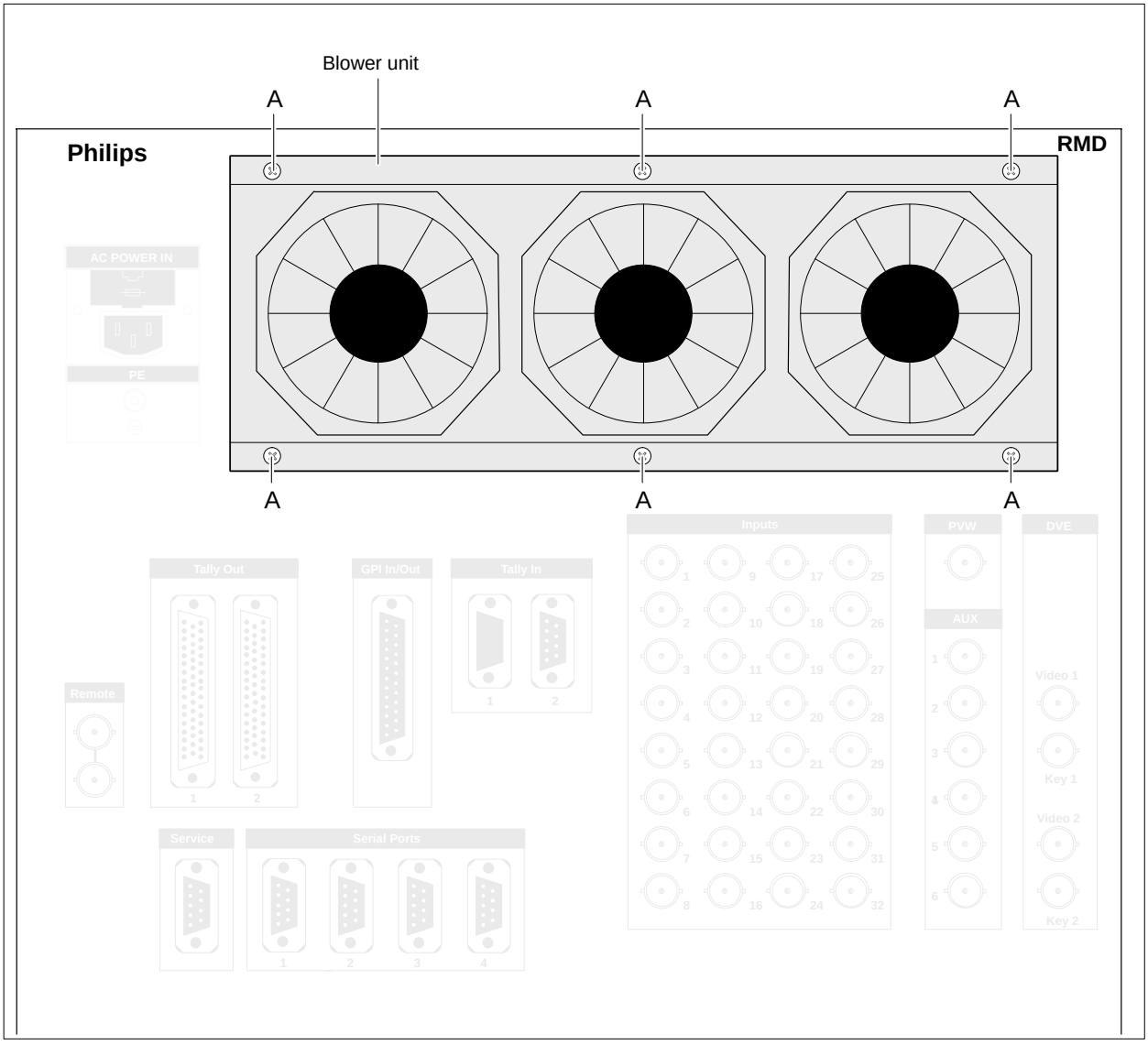


Fig. 7: Rear panel of E-box RMD 20/30